CQ

January 1961

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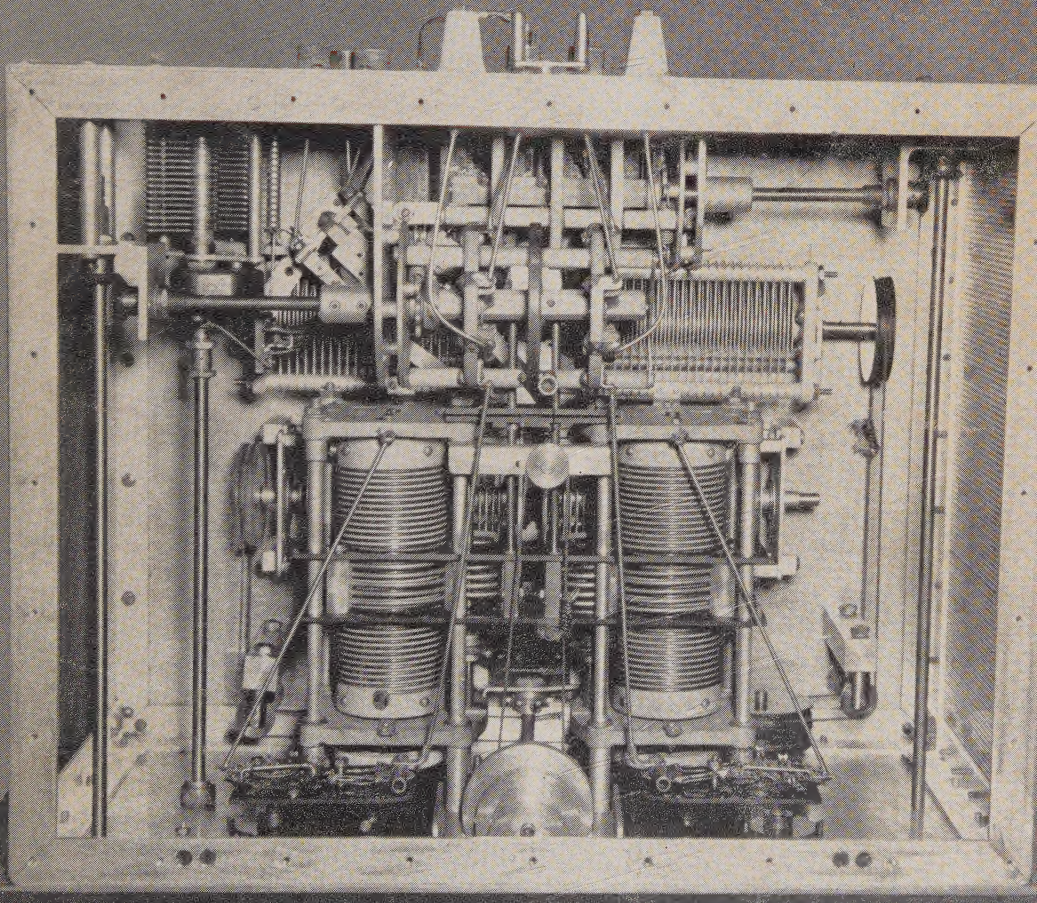

The Radio Amateur's Journal

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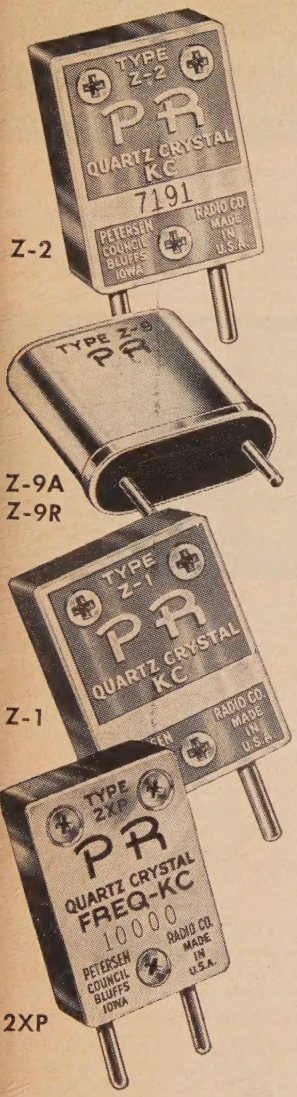

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Z-9A
Z-9R

Z-1

2XP

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40 and 80 Meters, PR Type Z-2

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CITIZENS BAND CLASS "D" Type Z-9R, Transmitter

FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225; calibrated to .005%. (Be sure to specify manufacturer of equipment)..... $2.95 Net

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Suitable for converters, experimental, etc. Same holder dimensions as Type Z-2.

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12001 to 25000 Kc. (3rd Overtone) ±10 Kc..... **$4.45** Net

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Official assigned frequencies in the range. Calibrated to .005%. 1600 to 10000 Kc..... **$3.45** Net

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4.5 Mc. Intercarrier, .01% ..... **$2.95** Net

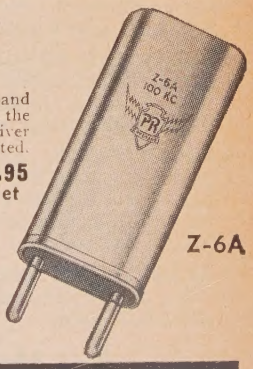
5.0 Mc. Signal Generator, .01% ..... **$2.95** Net

10.7 Mc. FM, IF, .01% ..... **$2.95** Net

Type Z-6A, Frequency Standard

To determine band edge. To keep the VFO and receiver properly calibrated.

100 Kc. ... **$6.95** Net



Z-6A

PETERSEN RADIO CO., Inc. 2800 W. Broadway

COUNCIL BLUFFS, IOWA

EXPORT SALES: Royal National Corporation, 250 W. 57th Street, New York 19, N. Y., U. S. A.

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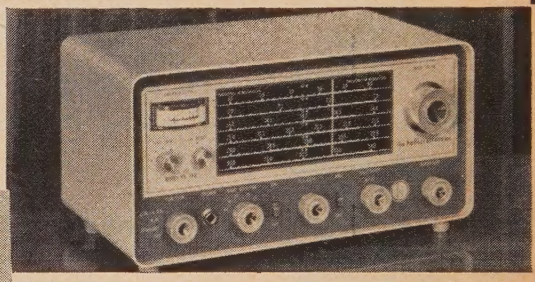
Very Hot News . . . from hallicrafters

Two great new kits... a complete, high-performance AM/CW station, from the world's most experienced designers of short wave equipment

HALLIKITS, we call them—a completely new concept of kit engineering that brings to your workshop, for the first time, these two outstanding advantages:

First, the unparalleled design experience of Hallicrafters' communications laboratories; and *second,* production-line proof of "Constructability" *before you buy.*

Have a wonderful time! Save a bundle of money! End up with a station the most experienced amateur would be proud to call his own.



HT-40 TRANSMITTER, $79.95

A perfect match for the handsome SX-140, both in quality and appearance. Hallicrafters' transmitter leadership is evident in every precision-engineered feature of this crystal-controlled 75-watt beauty—features as important to old-timers as they are to novices.

- **FEATURES:** You get excellent CW performance as well as AM. Full band switching, 80 through 6 meters. Enjoy easy tune-up and crisp, clean styling that has efficient operation as well as appearance in mind. Unit is fully metered, TVI filtered.
- **SPECIFICATIONS:** Maximum D.C. power input: 75 watts. Power output in excess of 35 watts CW, 30 watts peak AM phone. (Slightly less on 6 meters.) Frequency bands: 80, 40, 20, 15, 10 and 6 meters.
- **TUBES AND FUNCTIONS:** 6DQ5 power output; 6CX8 crystal oscillator and driver; 12AX7 speech amplifier; 6DE7 modulator; silicon high voltage rectifiers.
- **FRONT PANEL:** Function (AC off, tune, standby, AM, CW); Band Selector (80, 40, 20, 15, 10, 6); Drive control; Plate tuning, plate loading, Crystal-V.F.O.; Grid Current; Meter; AC indicator light; RF output.
- **REAR CHASSIS:** Microphone gain; antenna co-ax connector; remote control terminals; AC power cord.

SX-140 RECEIVER, $94.95

Doesn't it make sense to team up your skill with the experience of a company who has designed and built more high-performance receivers than any other in the world? Especially when the result is the *lowest-priced amateur band receiver available?*

- **FEATURES:** You get complete coverage of all amateur bands 80 through 6 meters, with extremely high sensitivity and sharp selectivity. Unit has RF stage; S-meter; antenna trimmer; and XTAL calibrator. Tuning ratio is 25 to 1.
- **CONTROLS:** Tuning; Antenna Trimmer; Cal. Reset; Function (AC off, standby, AM, CW-SSB); Band Selector; Cal. on/off; RF Gain; Auto. Noise Limiter on/off; Selectivity /BFO; Audio Gain; phone jack; S-meter Adj.
- **TUBES AND FUNCTIONS:** 6AZ8 tuned RF amplifier and crystal calibrator; 6U8 oscillator and mixer; 6BA6 1650 kc. IF amplifier and BFO; 6T8A 2nd detector, A.V.C., ANL and 1st audio; 6AW8A audio power amplifier and S-meter amplifier; (2) silicon high voltage rectifiers.

P.S. *Both units are available fully wired, and tested. SX-140, $109.95. HT-40, $99.95.*

halli-kits *from* **hallicrafters**

Chicago 24, Illinois

For further information, check number 4, on page 126

... where the new ideas in communications are born!

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WHEN WINTER COMES... G-76

When there's a chill in the air... when thoughts of sunny summer's mobile operations are crowded out by less pleasant, but highly pertinent considerations of anti-freeze—and windshield wipers that haven't yet been fixed. This is exactly the time to consider the addition of a new Gonset G-76 100 watt, 6 band transceiver to your worldly goods! A most pleasant traveling companion when your activities trend toward mobile, G-76 is also right at home... when winter comes.

There's real pleasure in store for you in home operation of equipment with the versatility of G-76. Just connect this powerful little gem to your available antennas—load up—operate! Have you tried 75 lately? Or 40? It may also come as a pleasant surprise to find that your G-76 will give the same lively performance on 6 meters as on the other five widely used 10, 15, 20, 40 and 80 meter bands. Like to keep your hand in with a little CW? G-76 has good clean keying characteristics, a stable BFO in its receiver.

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G-76.....Model #3338.....376.25
less power supplies

117V AC power supply in combination with speaker in matching cabinet.....Model #3349.....**145.00**

Compact 12V DC transistorized power supply for mobile operation. (Negative ground only)....Model #3350.....**145.00**

Dual conversion receiver • BFO for SSB and CW reception • Automatic Noise Limiter • Excellent sensitivity: 1 uv for 6 db S+ N/N ratio • Excellent selectivity: 3 to 3.5 kc bandwidth at 6 db down; 14 kc or less at 60 db down • Transmitter and receiver oscillators temperature controlled, have VR tubes . . . have low drift even with wide variation in both plate and filament voltages • Transmitter has highly stable VFO for all bands except 50 mc*. . . crystal control may also be used • Transmitter power input 100 watts AM phone; 120 watts CW • 6DQ5 Final Amplifier operates into pi-network matching system • Push-to-talk control, or by T-R switch on panel • Tuning meter on panel • Compact . . . only 12⅝"W, 5⅛"H, 11½"D.

* crystal control

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GONSET **GONSET** *Division of Young Spring & Wire Corporation*
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operation: 40 meters!

Not working 40 meters? We suggest you give this band serious thought! There's fine "rag-chewing" and good DX to be found on 40. You'll enjoy this fun-filled band even more with efficient, maintenance free Mosley antennas. DX-Rated for top performance.

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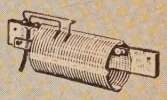
Make an inexpensive, fine performing dipole transmitting and receiving antenna at about ½ the length of a full size dipole-just 37 feet! Only one coil necessary. Rated to a full KW.

Amateur Net $7.95



TD-2 TRAP DOUBLET

Resonates at 40 and 75/80 meters providing a typical figure eight, ½ wavelength pattern at each resonant frequency. Overall length is 114 feet, 11 inches. Mosley "Sr." traps are aluminum enclosed and are frequency stable through wide climatic conditions. End insulators are high grade ceramic. Center connector securely holds No. 14 copper-weld wire. Rated to 1 KW. A complete antenna ready to go!

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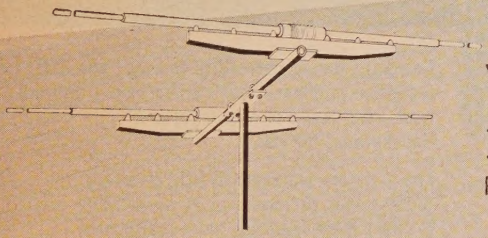


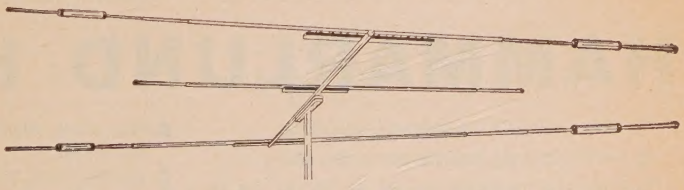
VPA-40-2 "Vest Pocket" BEAM

Ideal for low cost 40 meter operation - and this wonderful little DX antenna is only the size of an ordinary 20 meter beam! Rated to in excess of 1 KW.

Amateur Net $74.95

TA-20-40 THE BIG SIGNAL BEAM FOR 20 AND 40 METER OPERATION

For those radio amateurs who will not accept less than the finest . . . Performance to satisfy the DX enthusiast!



Built for operation at maximum amateur legal power. Frequency stability under all weather conditions. Tilting head included for ease of installation. Fully rust and corrosion proof - guaranteed! Holes are factory pre-drilled and elements color coded. Just one coaxial feed-line needed. Assembled weight with tilting head, 150 pounds.

Amateur Net $337.50

Mosley Electronics, Inc. 4610 N. Lindbergh • Bridgeton, Missouri

Mosley Dipole Connectors and Insulators are available to make it easy for you to construct your own 40 meter antenna using the 40-D Dipole Loading Coil.

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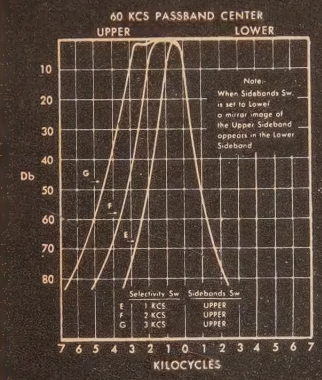

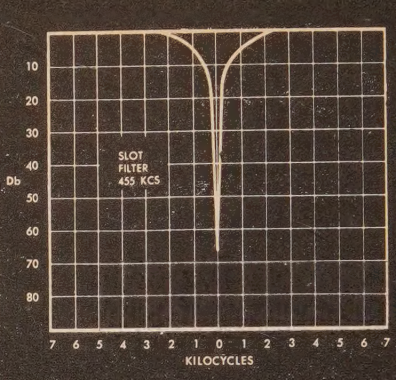

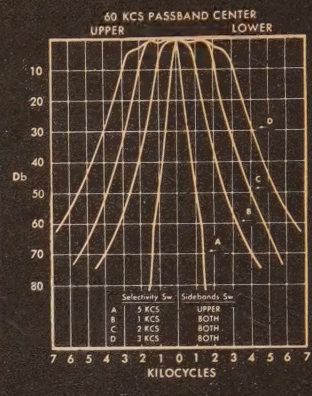

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Complete tuning versatility to meet any SSB reception problem—that's performance you can hear—and that's what you get in a Hammarlund HQ-180.

The general-coverage SSB HQ-180 offers true professional performance at an amateur price. It offers more features, more real quality and far more listening pleasure per dollar than any receiver in its class. Prove it to yourself—see and try the HQ-180 at your Hammarlund dealer.

SSB at its best

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- Triple conversion, 18-tube superheterodyne.
- Full dial coverage from 540 KCS to 30.0 MCS.
- Bandspread calibration for 80, 40, 20, 15 and 10 meter amateur bands.
- High frequency crystal filter for improved selectivity and shape factor of 1st IF amplifier.
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- Separate linear detector for CW and SSB reception.
- Adjustable IF amplifier for maximum selectivity.
- Selectable sideband, upper, lower or both.
- Built-in crystal calibrator.
- Selectable AVC obtained from 60 KCS IF.

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ZERO BIAS

SINCE the appearance of our editorial comment concerning, "Our Neighbors To The South", in the November 1960 issue of *CQ*, we have received a number of letters condemning the expressed attitude toward the licensing program now being proposed in Mexico.

To the members of the L.M.R.E. and the enthusiastic amateurs of Mexico we can only express our profound regrets for a misunderstanding which must have occurred. *CQ* in no way intended the editorial as a slur to the Mexican amateurs. It was encouraging to receive other letters from interested amateurs who took the comments as they were intended. Many readers offered their services to better the cause of reciprocal licensing.

There may be readers who are not completely acquainted with the reciprocal licensing problems which are currently being investigated.

May we explain!

Throughout the world, both in the United States and abroad, there is a small group of amateurs who have taken it upon themselves to advance the cause of reciprocal licensing. Some of them are active with the Armed Forces; many of them are ex G.I.'s who, during their overseas tours, became embittered by their lack of amateur radio rights; many are businessmen who now find it impossible to obtain a license to operate abroad.

Because the U.S. boasts of the richest economy in the world, and the fastest jets, we may expect an upsurge in travel in the next few years. We expect that American tourists will exceed foreign tourists by a ratio of 20 to 1.

Many American amateurs, not understanding the licensing requirements endorsed by foreign countries, have written to the country they wish to visit in an attempt to receive a license and operating privileges. To their dismay, in most cases, they found they were flatly refused. It's easy to understand . . . if a foreign government doesn't want an American operating an amateur station, that's that! Fortunately this is not the position taken by most other governments. Many foreign governments today agree that exchange of licensing is a healthy procedure and are doing all they can to encourage it. Why then are most Americans refused a license? The answer is simply that since the United States will not allow foreign hams to operate on our shores, they will not allow American hams to operate on their shores.

The Communications Act of 1934, As Amended, (now 27 years old) states, SEC. *310. (a) The station license required hereby shall not be granted to or held by—(1) Any alien or the representative of any aliens; (2) Any foreign government or the representative thereof.* This then is the United States' stand on the matter. If, as of August 28, 1958, alien airplane pilots who hold a valid United States Pilot License can be exempt from this law, we wonder why alien radio amateurs who can qualify for our examination cannot be exempt as well. Surely an amateur wouldn't request a license through official channels and then use it for subversive purposes!

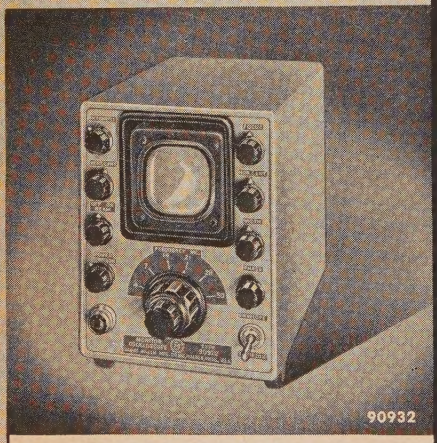
Basically then we would expect that the Mexican government should ban our amateurs from operating there because "we" have not allowed them to operate here.

This, however, is where the pattern changes. The Mexican Government has consistently allowed American amateurs to operate *without* the benefit of United States reciprocity. This is certainly a grand move to foster better inter-American relationships!

CQ is confident that reciprocal licensing is inevitable. It is only fair that reciprocity start at "home", with "Our Neighbors To The South". ■

Designed for

Application



THE NO. 90932 MODULATION MONITOR

The No. 90932 Amateur Band Monitor Oscilloscope is a complete oscilloscope for monitoring the modulated r-f output of a transmitter. Built-in link-coupled tuned circuits cover all amateur bands 3.5 to 54 mc. All circuits and accessories are built in. The monitor will display the r-f envelope and/or the trapezoidal monitoring pattern of single side band transmitters or amplitude modulated transmitters. It shows the linearity or non-linearity of Class-B r-f amplifiers, parasitic oscillation, neutralization, and r-f output.

JAMES MILLEN MFG. CO., INC.

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Letters..... to the Editor

Phone Patch Trouble

Editor, *CQ:*

There seems to be some difficulty with the phone patch described in my October 1960 article, and I think that I can straighten out some fellows who are having trouble. Some fellows I work on the air tell me that the thing works like a charm. Others say they can't get a null no matter what they do. One chap even called me from Pennsylvania one night, and I finally got a clue as to what was happening. He was putting the patch across the speaker voice coil output terminals of his receiver!

This point never occurred to me because I have mine plugged into a phone jack which has a fairly high resistance in series to the 500 ohm receiver output. Of course if you put the patch across a 3.8 or 6 ohm voice coil, you may as well put a short circuit across its input as far as getting any balance is concerned. The patch is a high impedance input device. For those fellows who do not have a high impedance receiver-output available, they will have to use an input transformer in the patch.

Some have also complained that they do not get enough level out of it to trip the VOX on the transmitter. These are people who have a transmitter input labelled "phone patch", which requires a fairly high level to operate it. In my case I plugged the patch right into the low level mike input on my transmitter, and of course there is more than enough level to trip the VOX. In fact, I have to keep the transmitter mike gain control turned down to keep from overdriving.

Paul Lee, W3JHR
5209 Bangor Drive, Kensington, Md.

Some of My Best Friends . . .

Editor, *CQ:*

I read the article "Some of My Best Friends are Novices" by K9MYZ in the November issue of *CQ* and found it very interesting. I am a 14 year-old Novice and soon hope to get my General License. My first QSO was with a General who not only sent a QSL card to me but also wrote a 2 page letter. I realized how much I appreciated that letter and have since sent letters along with my QSL to most of my contacts and I'm sure they appreciate my efforts. A lot of Generals stick to c.w. to make contacts with Novices and I have deduced that Generals are friendly and willing to help another ham. It is easier to learn the theory by memorizing it than it is to really *learn* it. After a year or two of experience, most Generals know what goes on in their rigs and why. My experience with Generals has been very rewarding. Because they helped me get started, and helped me with problems, such as with harmonics, learning code, the best antennas, etc. Therefore all I can say is: "Some of my best friends are Generals!"

David Beach, KNØYUT
721 Fourth Avenue, Coon Rapids, Iowa

Editor, *CQ:*

My compliments to W. J. Tancig, K9MYZ for his article "Some of my Best Friends Are Novices" and mainly concerning his last paragraph, where he suggests a "theory section of about four pages in each issue". It would be very much appreciated by many amateurs.

Alan Goldberg, K1KPI
90 Ridgewood Road, Willimantic, Conn.

◀ For further information, check number 8, on page 126

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CITIZENS BAND TRANSCEIVER

that meets FCC regulations*

*EICO premounts, prewires, pretunes, and seals the ENTIRE transmitter oscillator circuit to conform with FCC regulations (Section 19.71 subdivision d). EICO thus gives you the transceiver in kit form that you can build and put on the air without the supervision of a Commercial Radio-Telephone Licensee!

designed by Hams . . . for Hams . . .

to the highest Ham standards

#760: 117 VAC Kit $59.95 Wired $89.95

#761: 117 VAC & 6 VDC
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incl. mtg. bracket (Pat. Pend.)

Kit $69.95
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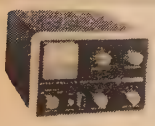
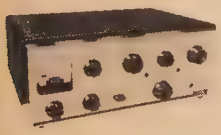
Highly sensitive, selective SUPERHET (not regenerative) receiver with 5½ dual function tubes and RF stage. Continuous tuning over all 23 bands. Exclusive Super-Hush® noise limiter. AVC. 3"x5" PM speaker. Detachable ceramic mike. 5 Watt xtal-controlled transmitter. Variable "pi" network matches most popular antennas. 12-position Posi-Lock® mounting bracket. 7 tubes and 1 xtal (extra xtals available). Covers up to 20 miles. License available to any citizen over 18 — no exams or special skills required; application form supplied free. Antennas optional.

Additional crystals $1.95 each.

Most EICO distributors offer budget terms.



NEW! 60-WATT CW TRANSMITTER #723
Kit $49.95 Wired $79.95
Ideal for novice or advanced ham needing low-power, stand-by rig. 60W CW, 50W external plate modulation. 80 through 10 meters.



90-WATT CW TRANSMITTER* #720 Kit $79.95 Wired $119.95
*U. S. Pat. No. D-184,776
"Top quality" — ELECTRONIC KITS GUIDE. Ideal for veteran or novice. 90W CW, 65W external plate modulation. 80 through 10 meters.

HIGH-LEVEL UNIVERSAL MODULATOR-DRIVER #730
Kit $49.95 Wired $79.95
Delivers 50W undistorted audio. Modulates transmitters having RF inputs up to 100W. Unique over-modulation indicator. Cover E-5 $4.50.

GRID DIP METER #710
Kit $29.95 Wired $49.95
Includes complete set of coils for full band coverage. Continuous coverage 400 kc to 250 mc. 500 ua meter.

COLOR & MONO DC-5MC LAB & TV 5" OSCILLOSCOPE #460
Kit $79.95 Wired $129.50
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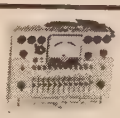
PEAK-TO-PEAK VTVM #232 & *UNI-PROBE®
Kit $29.95 Wired $49.95
*U. S. Pat. No. 2,790,051
VACUUM TUBE VOLTMETER #221
Kit $25.95 Wired $39.95

RF SIGNAL GENERATOR #324 (150kc-435mc)
Kit $26.95 Wired $39.95
TV-FM SWEEP GENERATOR & MARKER #368
Kit $69.95 Wired $119.95



DYNAMIC CONDUCTANCE TUBE & TRANSISTOR TESTER #666
Kit $69.95 Wired $109.95
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Kit $34.95 Wired $49.95

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CQ-1

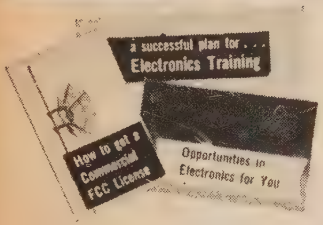
Name.....
Address.....
City..... Zone .... State .....

Add 5% in the West.

ENGINEERS: Excellent career opportunities in creative electronics design. Write to the Chief Engineer.

For further information, check number 9, on page 126

How To Get an FCC License (Commercial)



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Completion of the Master Course (both Sections) will prepare you for a First Class Commercial Radio Telephone license with a Radar Endorsement. Should you fail to pass the FCC examination for this license after successfully completing the Master Course, you will receive a full refund of all tuition payments. This guarantee is valid for the entire period of your enrollment agreement.

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CQ 72

English Counties

Editor, *CQ:*

During our recent trip to America with the English Legal Party I was asked on several occasions to explain the abbreviations in the addresses of the British Amateurs, such as Cambs. for Cambridgeshire. In view of the many times I was asked this question perhaps the following list for England and Wales may help.

In return for this information will you please publish the translation of MD., VA., IND. and MO. This request may sound stupid, but not so if you do not have available details of your call areas.

R. F. G. Thurlow, G3WW
North House,
Wimblington,
March, Cambs., England

England

Beds.	Bedfordshire	**Leics.**	Leicestershire
Berks.	Berkshire	**Lincs.**	Lincolnshire
Bucks.	Buckinghamshire	**Middsx.**	Middlesex
Cambs.	Cambridgeshire	**Northants.**	Northamptonshire
Dorset.	Dorsetshire	**Notts.**	Nottinghamshire
Glos.	Gloucestershire	**Oxon.**	Oxfordshire
Hants.	Hampshire	**Staffs.**	Staffordshire
Herefore.	Herefordshire	**Salop.**	Shropshire
Herts.	Hertfordshire	**Warks.**	Warwickshire
Hunts.	Huntingdonshire	**Wilts.**	Wiltshire
Lancs.	Lancashire	**Worcs.**	Worcestershire
		Yorks.	Yorkshire

Wales

Caerns.	Caernarvonshire
Carms.	Carmarthenshire
Flint.	Flintshire
Glam.	Glamorgan
Mon.	Monmouthshire
Pembs.	Pembrokeshire

To reciprocate, we list the following States and their abbreviations.—Ed.

W1

Conn.	Connecticut	N.H.	New Hampshire
Me.	Maine	R.I.	Rhode Island
Mass.	Massachusetts	Vt.	Vermont

W2

N.J.	New Jersey
N.Y.	New York

W3

Del.	Delaware	Pa.	Pennsylvania
Md.	Maryland	D.C.	District of Columbia

W4

Ala.	Alabama	N.C.	North Carolina
Fla.	Florida	S.C.	South Carolina
Ga.	Georgia	Tenn.	Tennessee
Ky.	Kentucky	Va.	Virginia

W5

Ark.	Arkansas	N.M.	New Mexico
La.	Louisiana	Okla.	Oklahoma
Miss.	Mississippi	Tex.	Texas

W6

Calif.	California

W7

Ariz.	Arizona	Oreg.	Oregon
Ida.	Idaho	Ut.	Utah
Mont.	Montana	Wash.	Washington
Nev.	Nevada	Wyo.	Wyoming

W8

Mich.	Michigan
O.	Ohio
W. Va.	West Virginia

W9

Ill.	Illinois
Ind.	Indiana
Wis.	Wisconsin

WØ

Colo.	Colorado	Mo.	Missouri
Ia.	Iowa	Neb.	Nebraska
Kan.	Kansas	N. Dak.	North Dakota
Minn.	Minnesota	S. Dak.	South Dakota

KH6

Haw.	Hawaii

KL7

Alas.	Alaska

An unsolicited letter that speaks for itself—

ALL-FLORIDA COMMUNICATIONS CO.

10 N.E. 3RD AVENUE
MIAMI, FLORIDA

TELEPHONE
FRANKLIN 3-7245

December 1, 1960

Communication Products Co., Inc.
Marlboro, N. J.

Gentlemen:

Attached is an order for more of your Cat. No. 181-509 450 Mc gain antennas.

I have tried many types of antennas for 450 Mc and have come to the inescapable conclusion that this is the finest 450 Mc vehicular antenna of them all. My tests have been made at extreme fringe areas as well as closer in and have included comparative A-B tests as well as the changing of antennas and returning to a given location.

Not only do your antennas perform far better than anything else tried, but they are good looking as well. In fact, one customer who gave up his radio because he was moving to another area, wanted to keep his antenna because it looked so good on his car.

As a result of the great advantage over the roof-top whips, I have now discontinued using roof-top antennas altogether on new subscriber installations and am going to your Cat. No. 181-509 gain antennas. As the old installations are traded in, or show a need for better coverage, they also will be replaced with your new antennas.

In short "you-all" make a mighty good antenna!

Very truly yours,

Alan H. Rosenson

Alan H. Rosenson
Owner and Chief Engineer

AIR-PAGE — AIR-COM

SINCE 1933

Communication Antenna Systems for American Business

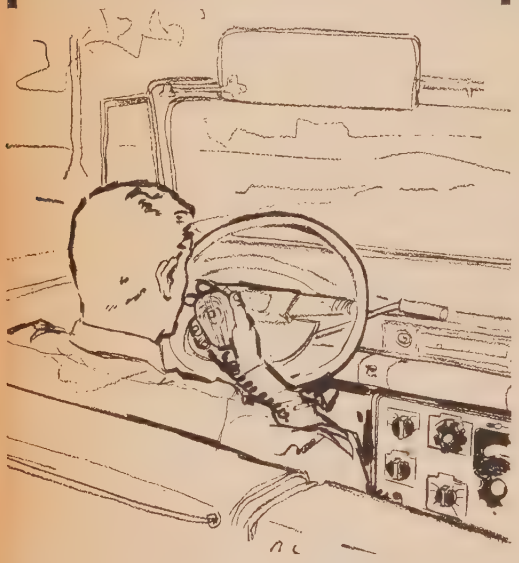
Communication Products Company, Inc.

MARLBORO • NEW JERSEY

MAKE SURE YOUR STATION-ON-THE-GO— GOES FIRST CLASS

THE TURNER 350's

magnificent mobile microphones for moderate money



This reasonably priced, hand-held microphone is the perfect mike for amateur mobile rigs. Its price range fits the typical amateur's budget but its performance is strictly professional. Prices for the three microphones in the 350 series range from $16.80 through $19.00. All models are wired for relay operation, and feature extra-tough plastic case; hanger button and standard dash bracket for easy mounting; 11″ retractable, five-foot extended Koiled Kord; and handy, momentary on-off switch. The 350's also excel as citizen's band and paging microphones.

TYPE	350X crystal	350C ceramic	350R carbon
RESPONSE	60-8,500	80-7,000	200-4,000
OUTPUT	—48 db	—54 db	—38 db
LIST PRICE	$16.80	$16.80	$19.00

For complete specifications write:

THE TURNER MICROPHONE COMPANY

909 17th St. NE, Cedar Rapids, Iowa

For further information, check number 10, on page 126

Mathews' Law

Editor, *CQ*:

I find Mr. Mathews article a novel approach to Ohms Law.

I learned a proverb which might help your readers remember if in an inductive or capacitive circuit, the current lags or leads the voltage. The proverb is "ELI the ICE man".

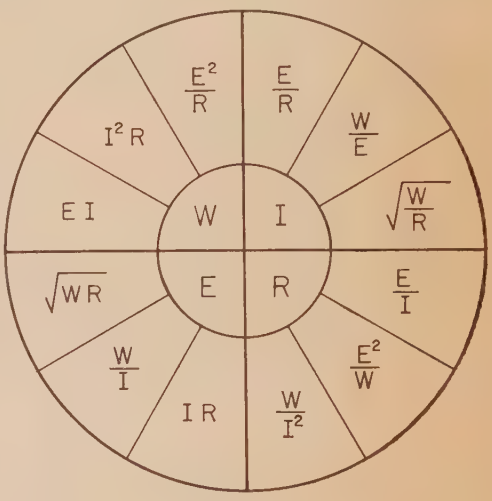
As you see the word ELI, E is voltage, L is inductance and I is current. So, in an inductive circuit, the voltage leads the current. The opposite is true of a capacitive circuit. In the word ICE, I is current, C is capacity and E is voltage.

Arnold J. Carmody, K2BZC
319 Loma Avenue, Syracuse 8, New York

Editor, *CQ*:

Re: "Mathews' Law", (*CQ* for November 1960 p. 57.) reminded me of the chart below which I have carried for perhaps 25 or 30 years.

Bruce Cline, W4PJV
Beach Grove, Tennessee



Reciprocity

Editor, *CQ*:

Once again the question of reciprocal licensing becomes vitally important. On December 31, 1960, the country of Mexico will probably lift all operating privileges from U.S. amateurs licensed in that country. I think it is high time the U.S. changed its policy and allowed aliens resident in this country or visiting here to operate an amateur radio station under our rules and regulations. I realize that the ARRL has been doing all in its power for the last few years to accomplish this, but with a notable lack of success. I believe this failure stems directly from the lack of interest in this project by many of our amateurs.

The question is raised as to just what an ordinary amateur can accomplish along this line. If, in a concerted campaign, both *QST* and *CQ* ask their readers to write to their congressmen, and do this editorially and through a full page advertisement placed at a strategic place in the magazine, the resultant flow of letters would impress on the government the urgency of the problem. After this campaign of letters, the ARRL will have to present a more forceful argument in favor of this position than ever before. Perhaps as a result of this, we can finally begin to get some action.

What incentive is there for the amateur to engage in such a campaign? First of all, all of us should be interested in gaining new friends for the U.S. abroad, and raising our prestige in the eyes of the other nations of the world. Our recent FCC decision to expand the 20 meter phone band did little to alleviate the QRM we experience here, but did create widespread enmity toward us as a result of this action. Many DX stations have been virtually forced off this segment of the band due to inability to compete with our numbers and kilo-

NOW LPA-1 AVAILABLE IN KIT FORM

The most copied grounded-grid 1-KW linear amplifier by those who build their own.

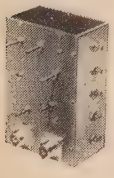
AMPLIFIER KIT

LPA-1 Kit—(less tubes, cabinet and blower)	$269.50
Blower—(optional for warm climate use)	19.95
Cabinet—	48.75
Adapter panel for rack mounting	9.95
LPA-1 Amplifier—Factory wired and tested Complete with cabinet, blower and tubes	375.00

POWER SUPPLY KIT TOO

LPS-1 Kit—(complete with cabinet but less tubes)...	$169.50
Adapter panel for rack mounting	9.95
LPS-1 Power Supply—Factory wired and tested Complete with cabinet and tubes	205.00

(See Nov. QST, page 115 and Nov. CQ, page 21, for outstanding features)
Kits available in February



LPA-MU Matching Unit Price $36.00
LPA-MU-2 Matching Unit Price $36.50
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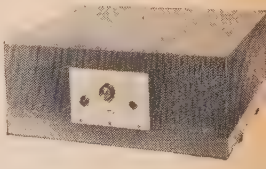

LPS-1 Power Supply for LPA-1

B & W

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OTHER B&W EQUIPMENT: Transmitters AM-CW-SSB • Transistorized Power Converters and Inverters • Dip Meters • Matchmasters • Frequency Multipliers • Low Pass Filters • T-R Switches • R. F. Filament Chokes • Transmitting R. F. Plate Chokes • Band-Switching Pi-Network Inductors • Cyclometers • Antenna Coaxial Connectors Baluns • Variable Capacitors • Toroidal Transformers • Coaxial Switches • Fixed and Rotary edgewound Inductors • Plug-in Coils with fixed and variable links • Straight type air wound coils in a variety of dimensions.

For further information, check number 11, on page 126

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SUPERIORITY IN SOUND

FIDELITY . . . FOR HAMS WITH A LIKING FOR LIGHTNESS

LIGHT . . .

Boom Mike Headset—Light 4 oz. parallel connected receivers transmit sound directly to ears through adjustable tone arms. Rubber or plastic tips block background noise without pressure, allowing continuous communication under the most difficult conditions. Available with a wide choice of general or special purpose microphones. Mike boom, angled for best pickup, has 360° swivel. Ideal headset for mobile use. Impedance: 500 ohms. Frequency response: 50 to 5000 cps. Sensitivity: 114 db above .0002 dynes per sq. cm. for 1 milliwatt input.

LIGHTER . . .

Twinset—FAA approved, the 1.6 oz. Twinset is standard on airlines; fits any amateur, experimental or commercial installation. The lightest twin magnetic receiver headset ever made! Sound is piped through adjustable tone arm. Eartips block out background without touching ears. Standard 5′ cord and phone plug or optional cord with volume control. Frequency response: 50 to 5000 cps. Sensitivity: 101 db above .0002 dynes per sq. cm. for 10 microwatts input.

STILL LIGHTER . . .

Monoset—Under-chin 1.1 oz. set features removable eartips, optional volume controls. Durable aluminum construction, Monoset has 5′ cord and standard plug. Frequency response: 100 to 5000 cps. Sensitivity: 88 db above .0002 dynes per sq. cm. for 10 microwatts input.

LIGHTEST . . .

Tele-Fi—True dimensional sound and 30% better understanding with this ½ oz. set because of a 1 millisecond delay in sound reaching ear opposite receiver. Replaceable ear tips. Change from headset to accessory earset in seconds. Standard phone plug and 5′ cord included. Tele-Fi chin band usable with all TELEX transistor receivers. Frequency response: 50 to 5000 cps. Sensitivity: Comfortable at 1 milliwatt.

See your jobber today for superior quality communications accessories . . . by TELEX*! Or, write for information to:*

TELEX

Communications Accessories Division

Dept. CA-307, Telex Park, St. Paul 1, Minnesota

For further information, check number 12, on page 126

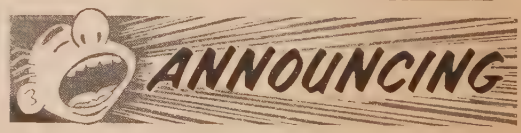
watts. To regain some of their good will, it is essential that the government of the U.S. amend its laws to allow them operating privileges in this country.

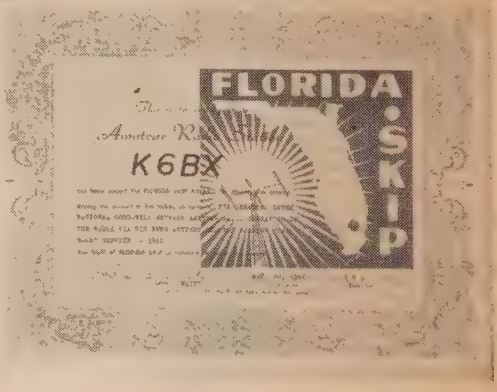
A second, and no less important a factor to the operating ham, is that other governments would be more inclined to look favorably upon an application by our amateurs for licenses. This would mean that DX-peditions could visit countries which now are no more than assigned call letters with no adequate stations operating. This would give many of us new countries to add to our DX worked.

My third and most important point is that I believe that the possibility of this Mexican decision represents a trend. Since the U.S. has been so adamant in its refusal to consider applications from foreign nationals, it is only natural that the other governments should begin to think seriously of restricting or rescinding operating privileges of our citizens in their country. We could easily lose our licenses in Japan, Germany, and all the South American countries, to name a few. This could do nothing more than have a deleterious effect on the next frequency allocation conference. We must keep the amateur service strong and not lose any of our present stations if we are to keep our talking points in respect to the other services. This bickering and non-reciprocity can only give them a lever with which to force themselves into occupation of our present frequencies.

I would like to see this campaign begun immediately by both *QST* and *CQ* so that, working jointly, we might stand a chance of getting this type of legislation passed in the next session of Congress. If we amateurs don't take matters into our own hands, and soon, we may find the trend grow into a snowball and have our privileges of operation restricted to U.S. territory. The time for action is now, before any of the other governments act. It should be apparent that if we act after they do, we may have to wait years before they will again allow operation by our hams.

S. T. Fleming, Jr., K4KSZ
1001 N.W. 17th Court
Miami 35, Florida





K6BX Receives *Florida Skip* Award

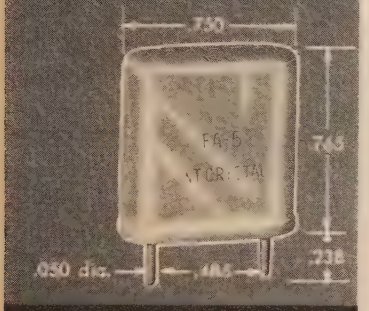
The above certificate was recently issued by the *Florida Skip* to Clif Evans, K6BX for: "Creating International Good-Will between amateur radio operators of the world via his *News Letter* and Foreign *Call Book* Service—1960".

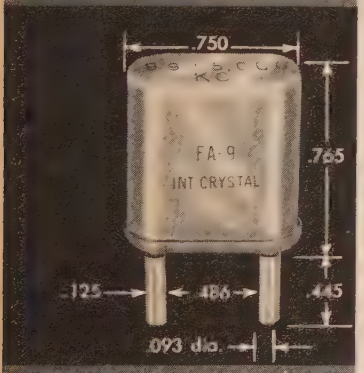
As many of you know Clif is the clearing house whereby DX stations write, to be put on his list for out of date *Call Books* (less than 3 years old) donated by amateurs throughout the country. Why don't you write Clif and get all the dope. Do your part to cement friendly relations throughout the world.

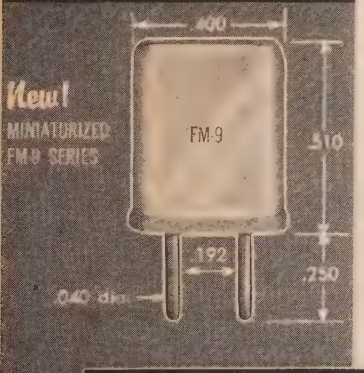
[*Continued on page 104*]

Amateur Crystals

1000 KC to 137 MC - .01% TOLERANCE







Wire mounted, plated crystals for use by amateurs and experimenters where tolerances of .01% are permissible and wide-range temperatures are not encountered.

Just any crystal in any oscillator will NOT combine to produce spot frequencies. These crystals are designed to operate into a 32 mmf load on their fundamental between 1000 kc and 15000 kc. Overtone crystals operate at anti-resonance on 3rd mode and series resonance on 5th and 7th mode crystals.

- **HOLDERS:** Metal, hermetically sealed. FA-5 and FA-9 are HC/6U pin type while the FM-9 is an HC/18U pin type.
- **FREQUENCIES** (Specify crystal type and frequency when ordering.)

	FA-5 and FA-9	Price	FM-9	Price
Fundamental	1000 - 1499 kc	$ 5.75	Not available	
	1500 - 1799 kc	$ 4.95	Not available	
	1800 - 1999 kc	$ 4.40	Not available	
	2000 - 9999 kc	$ 3.30	8000 - 9999.999 kc	$ 5.00
	10000 - 14999 kc	$ 4.40	10000 - 15000 kc	$ 5.50
	15000 - 20000 kc	$ 5.50	15001 - 19999.999 kc	$ 6.50
Overtone (3rd)	10 - 14.99 mc	$ 4.40	Not available	
	15 - 29.99 mc	$ 3.30	20 - 39.99 mc	$ 5.00
	30 - 59.99 mc	$ 4.40	40 - 59.99 mc	$ 5.50
Overtone (5th)	60 - 75.99 mc	$ 4.95	60 - 89.99 mc	$ 6.50
	76 - 99.99 mc	$ 7.15	90 - 100 mc	$ 8.50
	Not available		101 - 110 mc	$10.00
Overtone (7th)	100 - 137 mc	$ 9.35	Not available	

Overtone crystals are calibrated on their overtone frequency. They are valuable for receiver-converter applications and are NORMALLY NOT UTILIZED IN TRANSMITTERS, since only a small amount of power is available under stable operating conditions.

- **CALIBRATION TOLERANCE:** ± .01% of nominal at 30° C.
- **TEMPERATURE RANGE:** −40° to + 70° C. ± .01% of frequency at 30° C.
- **DRIVE LEVEL:** Recommended, maximum 3 milliwatts for overtones; up to 80 milliwatts for fundamentals, depending on frequency.

ONE DAY PROCESSING . . .

Orders for less than five crystals will be processed and shipped in one day. Orders received on Monday through Thursdays will be shipped on the day following. Orders received on Friday will be shipped the following Monday.

WRITE FOR 1961 CATALOG **FREE!**

INTERNATIONAL CRYSTAL MFG. CO., INC.

18 NORTH LEE • OKLAHOMA CITY, OKLA.

For further information, check number 13, on page 126

FOR THE PROFESSIONAL AMATEUR

Globe Chief Deluxe

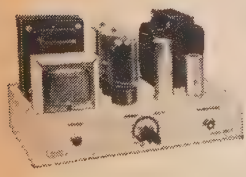
The new Globe Chief Deluxe, is a self-contained 90w transmitter for CW, bandswitching 10-80M. 75w meter indication for Novice use. Modified grid block keying or cathode keying with VFO. Provision for plate or screen modulator by simple plug in. Built-in power supply. Standard coax antenna fittings. 3-color kit diagrams. Pre-punched chassis, all parts and tubes included in kit. Rotary switches throughout.

Wired $79.95 **Kit** $59.95

MOST DISTRIBUTORS OFFER TERMS OF 10% DOWN PAYMENT AND 18 MONTH PAY PLANS.

Wired $45.95, with tubes

Kit, $34.95, less tubes



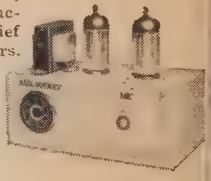
UM-1 Universal Modulator

The UM-1 Universal Modulator is a Class A or AB-2 modulator, driver for higher power modulator or PA amplifier. Matches output impedances 500-20,000 ohms. Uses carbon or crystal mike. Supplies up to 40w audio with proper tubes. Can add external meter for monitoring modulator cathode currents.

SM-90 Screen Modulator

The SM-90 Screen Modulator permits radio telephone operation at minimum cost. All self contained. Printed circuit board, all parts and complete instructions. Ideal for use with Chief Deluxe and similar tranmitters.

Kit only, 11.95



SEE YOUR LOCAL DISTRIBUTOR OR WRITE DIRECT TO

GLOBE ELECTRONICS
A DIVISION OF TEXTRON ELECTRONICS, INC.
COUNCIL BLUFFS, IA.

For further information, check number 14, on page 126

RADIO SHACK MAKES COMMUNICATIONS HISTORY IN SPECTACULAR PURCHASE!

THE BUY THAT SCOOPED THE INDUSTRY!

GONSET

G-11 CITIZENS' COMMUNICATOR *2-Way Radio*

SAVE $40!

Only $5 Monthly

Regular $124.50

$84.50

MICROPHONE AND ONE CRYSTAL INCLUDED!

BUY TWO FOR $164.95

- ★ No Technical Knowledge Required to Operate
- ★ Crystal-controlled . . . No Fussy Tuning
- ★ Compact . . . Lightweight . . . Wide Range Radio
- ★ 117 VAC for Home . . . Factory . . . Office
- ★ 12 VDC for Auto . . . Tractor . . . Boat
- ★ Meets All FCC Requirements . . . Made in U.S.A.

SPECIFICATIONS: Frequency Range; 26.965 to 27.285 megs. Power Output; not to exceed 4.8 watts. Modulation; 80% minimum at 15%. Power Input; 60 watts. Receiver Sensitivity; 1.5 uv, 30% modulation at 1000 cycles for 6 db signal-to-noise ratio. Receiver Selectivity; —5 kc at 6 db down. Audio Response; —3 db 500 to 2500 cycles, down at least 10 db from 1000 cycle value at 5000 cycles. Audio Output; 2.5 watts into 3.2 ohms, with 10% distortion. 5¼H x 6¾W x 6¾D.

EW LOW PRICE! 32% OFF! ADIO SHACK EXCLUSIVE!

dio Shack's most sensational bargain with BIG sav-gs for you! G-11 Citizens' Communicator now selling the lowest price ever . . . and for a limited time ly! Look at all the BIG features this 2-way radio tion can give you . . . high stability . . . drifting off frequency . . . provides instant, depend-le communications . . . use between any number of tions. It's compact . . . lightweight . . . rugged . . . ple to operate . . . and mounts easily on any vehicle, ctor, boat, plane or at any fixed station, and the ilt-in speaker permits calls to be heard some distance m set! Imagine all the uses for the communicator on farm, at home, at work or just about anywhere. n't put it off any longer, order yours today and h-in on the BIG savings.

der No. 45DX785, 117 VAC 3303, Sh. Wt. 10 lbs. 84.50
der No. 45DX786, 12 VDC 3304, Sh. Wt. 10 lbs. 84.50

ORDER TODAY FOR CHRISTMAS DELIVERY

RADIO SHACK CORPORATION Dept. 1C
730 Commonwealth Avenue, Boston 17, Mass.

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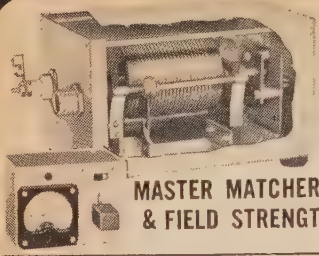
RITE FOR FREE COPY OF RADIO SHACK'S NEW 192-PAGE SALE CATALOG!

For further information, check number 15, on page 126



6 or 12 volt models

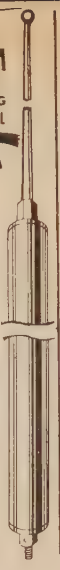
Complete **$24.95**

Automatically tunes entire band by remote control.

MASTER MATCHER & FIELD STRENGTH METER

NEW! SLIM-JIM

ALL-BAND BASE LOADING ANTENNA COIL



96" WHIP

FOR 10, 11, 15, 20, 40, 80 METERS

SIZE 1⅜"x 19"

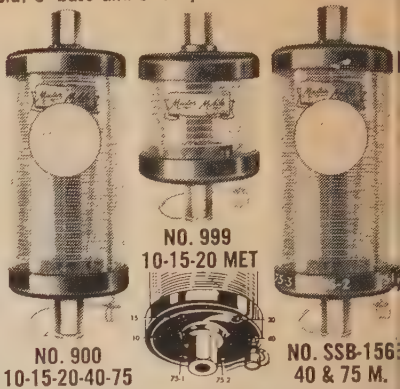
Positive action, just slide whip in or out to loading point and lock nut into position.

NO. B-1080

$17.95

MULTI-BAND ANTENNA COILS

New Plug-in type coils, designed to operate with std. 3' base and 5' whip.



NO. 900
10-15-20-40-75

NO. 999
10-15-20 MET

NO. SSB-156
40 & 75 M.

- Rigidly tested & engineered—found to have "Q" of 525
- Handles 500 Watts input
- Operates into a 52-ohm cable
- Positive contact—noisefree, troublefree operation
- Weathersealed
- Factory pre-tuned—no adjustments needed.

YOUR CHOICE EA **$14.95**

ULTRA-HI-"Q" COILS FOR 80, 40, 20, & 15 METERS

Your Choice **$5.25 ea.**

The coil with the highest "Q" ever obtained. Tested and found to have a "Q" of well over 515. Use with 36" base sect. 60" whip. 3" Dia.

FIBRE-GLAS WHIPS

The Feather-Weight Antenna with Spring-Steel Strength!

Completely weather proof, breakproof antenna with special flexibility that prevents accidental shorting-out against overhead obstructions which can cause loss of signal, serious damage to equipment.

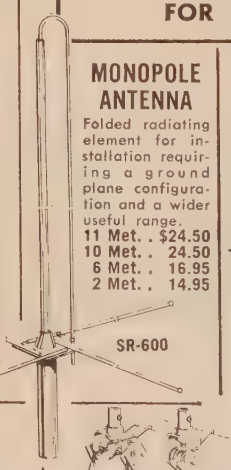
FG-60 60" $4.95
FG-72 72" $4.95
FG-84 84" $5.15
FG-96 96" $5.25
FG-103 103" $6.95

Leaders in the Design and Manufacturing of
Communication Equipment & Antennas
FOR LAND, SEA AND AIR

MONOPOLE ANTENNA

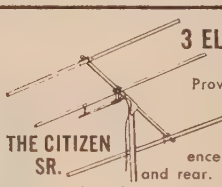
Folded radiating element for installation requiring a ground plane configuration and a wider useful range.

11 Met. . $24.50
10 Met. . 24.50
6 Met. . 16.95
2 Met. . 14.95



SR-600

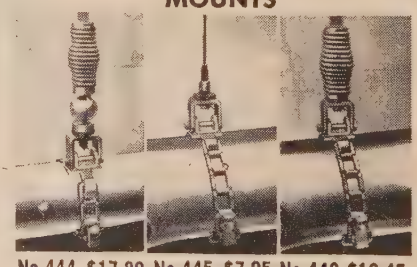
3 ELEMENT 11M. BEAM NO. SR-500



THE CITIZEN SR.

Provides a power gain of approx. 2½ (8DB) in forward direction. 10 to 1 interference reduction from sides and rear. VSNR-1. 1 to 1 at band center when fed with 52 OHM coax. . . **$36.00**

MOUNTS



No.444 $17.80 No.445 $7.95 No.446 $13.45

Adjustable to any bumper. No holes to drill.

MASTER-MAGIC WAND

New easy-to-install, single band, top-loaded plastic covered fiber glass antenna provides maximum performance at the most useful radiation frequencies.

10 Met.-	5 Ft. L	$8.95
11 Met.-	5 Ft. L.	8.95
11 Met.-35	In. L.	8.95
11 Met.-45	In. L.	8.95
15 Met.-	5 Ft. L.	8.95
20 Met.-	5 Ft. L.	8.95
40 Met.-	6 Ft. L.	9.95
80 Met.-	6 Ft. L.	9.95

SKYMASTER COAX ANTENNA

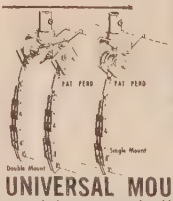
Gets your signal through where others fail. Concentrates signals at the lowest angle, provides omni-directional pattern for best coverage. Matches RG 59/U Cable. SM-700

11 Met. . . .	$17.95
10 Met. . . .	17.95
6 Met. . . .	15.95
2 Met. . . .	10.95

11M. CITIZEN BAND ANTENNA

40" base loaded S.S. whip antenna. Fitted with a ¼" dia. brass slug for all-purpose mounts. Low standing-wave ratio on most of band when fed with a 52 ohm coax.

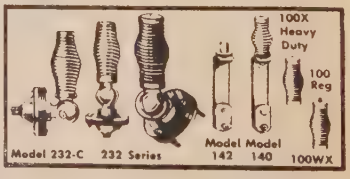
8B-27 **$12.95**

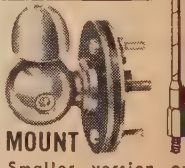


UNIVERSAL MOUNTS

Heavy-duty communications antenna mounts. Either mount can be attached through openings as small as 3/16". Receptacle for spring or whip with phenolic insulators. 3/8"-24-thread.

MM530 Deluxe Dbl. SS.	$21.95
MM531 Deluxe Sgl. SS.	11.95
MM520 Dbl. St-Cad. Pl.	7.95
MM519 Sgl. St-Cad. Pl.	4.95





MOUNT

Smaller version of Master Mobile Mounts, less spring. Swivels, mounts in all positions. ⅜"-24 thread for Magic Wand, and all Master Antennas.

No. J-11 **$2.95**

WRITE FOR FREE CATALOG

All products are for Universal Use-Mobile, Home, Marine, C.A.P., Civil Defense, Emergency, etc.

ELECTRONIC INDUSTRIES ASSOCIATION EIA EST. 1924

Master Mobile Mounts, Inc.

4125 W. JEFFERSON BLVD. • LOS ANGELES 16, CALIF.

AT LEADING RADIO JOBBERS EVERYWHERE

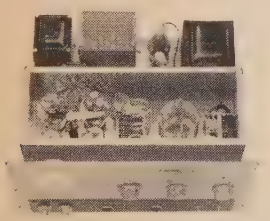
For further information, check number 16, on page 126

Heathkit® Amateur Gear — tops in quality and economy

HERE'S A NEW HEATHKIT GROUNDED GRID KW LINEAR AT A RECORD-SMASHING LOW PRICE . . . JUST $229.95

The new Heathkit "Warrior" is a completely self-contained, desk-top kilowatt linear, loaded with special features, at half the cost of comparable units! Compare feature for feature, quality component for quality component, you'll find no shortcuts . . . only the finest watt-per-dollar value in a linear amplifier on the amateur market today!

Maximum power input: SSB—1000 watts P.E.P., CW—1000 watts, AM—400 watts (500 watts using carrier controlled modulation), RTTY—650 watts. **Driving power required:** 50 to 75 watts—depending on frequency. **Output circuit:** Variable pi-network (50 to 75 ohms). **Input circuit:** Broad banded—requires no tuning. **Input impedance:** Approx. 70 ohms. **Band coverage:** 80, 40, 20, 15, 10 meters. **Panel metering:** Switch-selected, grid current, plate current, high voltage and relative power output for ease of loading. **Tube complement:** 4-811A, 2-866A. **Size:** 19½" W x 11⅝" H x 16" D.



This inside view shows the neat circuit layout and husky components that emphasize quality. Note the internal shielding of plate circuit for maximum protection against TVI.

CHECK THESE FEATURES . . .

Completely self-contained . . . HV, Fil. and Bias supplies built in.
Versatile . . . May be driven by any 50 to 125 watt transmitter or exciter—no matching or swamping network required.
Efficient . . . Stable grounded grid circuitry allows most driving power to appear in output for up to 70% efficiency.
Oil-filled capacitor . . . And 5-50 henry swinging-choke provide the excellent dynamic regulation required for high peak power output with low distortion.
Inexpensive tubes . . . 4 paralleled 811A's and 2-866A's, forced-air cooled by silent built-in fan.
Design . . . Special low-capacity filament transformer—requires less driving power—eliminates broad band filament RF choke.
Exclusive . . . Internal RF shielding of plate circuit for maximum TVI suppression.
Interlocked switching . . . prevents accidental application of HV before switching on filament and bias.
Neutralized . . . For the last word in stability in conjunction with grounded-grid operation.
Rugged construction . . . 16 gauge steel chassis—⅛" aluminum front panel—welded one-piece cabinet.
Easily assembled . . . Average time 8 hours.

Model HA-10. . . 100 lbs. . . . $23 dn., $20 mo. **$229.95**

HEATHKIT® by DAYSTROM **HEATH COMPANY** Benton Harbor, Michigan

Model DX-60 $82.95

- Built-in low pass filter
- Neutralized 6146 final amplifier
- Grid block keying
- Handsome low profile styling

more features, better performance in this new Heathkit transmitter

PHONE AND CW TRANSMITTER KIT (DX-60)

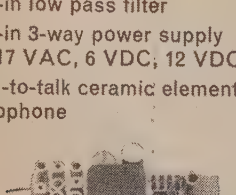
Smart modern styling . . . clean, rugged construction . . . and conservatively rated components all add up to ease of assembly, trouble-free operation and fine performance in the new DX-60 Transmitter. Offering far more than any other unit in its price and power class the DX-60 features a built-in *low pass filter* for harmonic suppression, *neutralized final* for high stability, *grid block keying* for excellent keying characteristics and easy access to crystal sockets on the rear chassis apron. A front panel switch selects any of four crystal positions or external VFO. Modulator and power supply are *built in. Single knob bandswitching* for 80 through 10 meters and the *pi-network output* provide complete operating convenience. A tune-operate switch provides protection during tuneup and a *separate drive control* allows adjustment of drive level without detuning driver. *Panel meter* shows final grid or plate current. A fine kit for the beginner as well as general class amateur, the DX-60 may be run at reduced power for novice operation. Operates CW or AM phone with crystal or VFO control. Power input is *90 watts peak*, carrier controlled phone or CW. Construction of the DX-60 is a breeze, with its clean circuit layout, precut and cabled *wiring harness* and the complete, informative instructions furnished. The handsomely-styled finished unit measures only 13¾″ W x 11½″ D x 6½″ H. 29 lbs.

Model DX-60...$8.30 dn., $8 mo.....**$82.95**

you get twice as much for your budget

Model HW-20 $199.95

- Tracked VFO & Exciter Stages for single knob tuning
- 10-watt RF output to antenna—6360 final
- Built-in low pass filter
- Built-in 3-way power supply for 117 VAC, 6 VDC, 12 VDC
- Push-to-talk ceramic element microphone



new transceivers for 6 & 2 meter nomads

VHF TRANSCEIVER KITS (HW-10 & HW-20)

"Mobile" or "Fixed", the new "Shawnee" 6-meter and "Pawnee" 2-meter transceivers bring you unprecedented performance, for each is a complete AM & CW Transmitter/Receiver combination with features unmatched at this price . . . just connect an antenna and you are in business! Transmitters feature a *built-in VFO* with all frequency determining components mounted on a "heat sink" plate for temperature stability and *four* switch-selected crystal positions for novice, CAP, MARS or net operation. VFO and all exciter stages are tracked for convenient *single knob tuning* over any 500 kc band segment (greater excursions require simple re-peaking of final). A VFO "spotting" switch is provided to "zero in" signals with transmitter off-the-air. The 6360 dual-tetrode final RF amplifier provides 10 watts of power *output* to the antenna and a built-in *low pass filter* is incorporated to suppress harmonics and other spurious radiation. The *dual-purpose modulator* provides a full 10 watts of audio for high level plate modulation of the final RF amplifier or 15 watts of audio for paging or public address use, selectable with push-pull switch. Superheterodyne receivers feature double conversion with first oscillator crystal-controlled. All oscillators are voltage regulated for stability. A large slide-rule dial and vernier tuning provide more than ample bandspread for both receiver and VFO. RF gain, BFO, ANL, Squelch, AVC on/off and transmitter controls are front panel mounted. *Tuning meter* is automatically switched to read signal strength or relative power output. Units come complete with built-in speaker, heavy duty AC & DC power cables, primary fused relay, adjustable mounting bracket and push-to-talk ceramic element microphone with coil cord & mounting clip. 6″ H x 12″ W x 10″ D. 34 lbs. each.

Model HW-20 (2 meters)...$20 dn., $17 mo.....**$199.95**
Expected Shipping Date Feb. 25.

Model HW-10 (6 meters) Coming Soon.

Model
HW-29A
$44.95

lowest cost transceivers on the air

- Operate from low-frequency crystals for greater stability
- Push-to-talk Transmit/Receive switch
- Variable receiver tuning
- Built-In AC power supply—easy conversion to mobile operation, using accessory vibrator power supply

Attn. HW-29 owners: Convert your "Sixer" to the new improved "A" model with this easy-to-install conversion kit. Allows use of 8 mc crystal for maximum stability.
Model HWM-29-1 1 lb. **$4.95**

2, 6 & 10 METER TRANSCEIVER KITS (HW-30, 29A, 19)

These three outstanding transceiver models bring you top performance at the lowest prices offered in complete amateur facilities. Each model has a crystal controlled transmitter and tunable, superregenerative receiver with RF preamplifier. Receivers pull in signals *as low as 1 uv* and the *5 watt* transmitters are ideal for emergency work or "local" net operation. Features include push-to-talk transmit/receive switch, metering jack, ceramic element microphone, and two power cables. Less crystal. 10 lbs. each.

Model HW-19 (10 meter)...$4 dn., $5 mo.....**$39.95**
Model HW-29A (6 meter)...$4.50 dn., $5 mo.....**$44.95**
Model HW-30 (2 meter)...$4.50 dn., $5 mo.....**$44.95**

with Heathkit® Amateur Gear

FREE CATALOG

Lists over 200 kits. Send for your free copy today!

MONEY BACK GUARANTEE

Heath Company unconditionally guarantees that each Heathkit product, whether assembled by our factory or assembled by the purchaser in accordance with our easy-to-understand instruction manual, must meet our published specifications for performance or your purchase price will be cheerfully refunded.

ORDER DIRECT BY MAIL OR SEE YOUR HEATHKIT DEALER

HEATHKIT® by DAYSTROM

HEATH COMPANY
Benton Harbor 12, Michigan

ORDERING INSTRUCTIONS

Fill out the order blank below. Include charges for parcel post according to weights shown. Express orders shipped delivery charges collect. All prices F.O.B. Benton Harbor, Mich. A 20% deposit is required on all C.O.D. orders. Prices subject to change without notice.

Please send the following HEATHKITS:

ITEM	MODEL NO.	PRICE

Ship via ( ) Parcel Post ( ) Express ( ) COD ( ) Best Way

( ) SEND MY FREE COPY OF YOUR COMPLETE CATALOG

Name _____

Address _____

City _____ Zone ___ State _____

Dealer and export prices slightly higher.

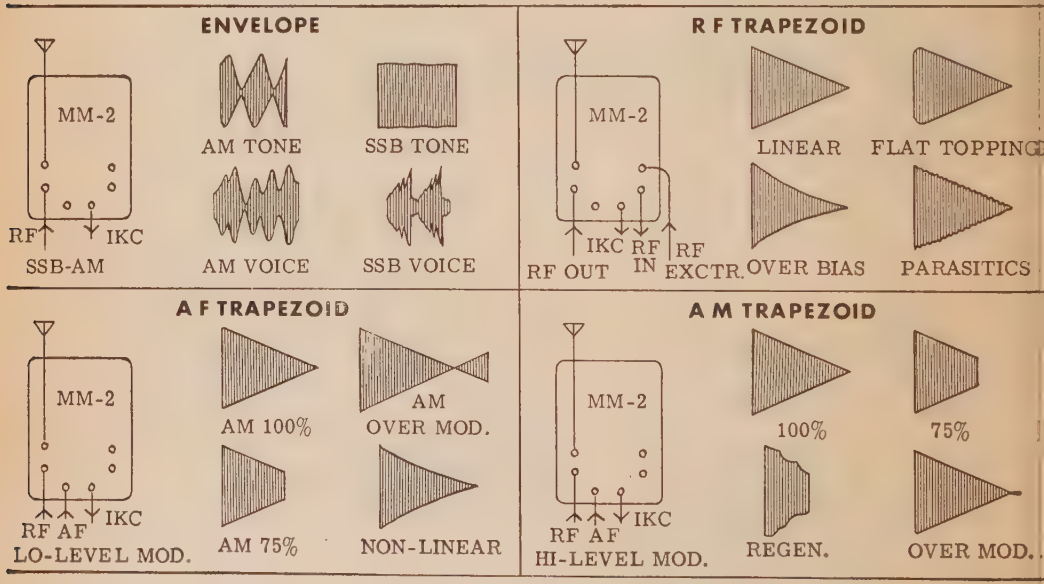
For further information, check number 17, on page 126

THE MULTIPHASE MODEL MM-2
RF ANALYZER

- Monitors the RECEIVED and TRANSMITTED signals. Shows flat-topping, overmodulation, parasitics, keyed wave shape etc. Silent electronic switching keyed by transmitted RF.
- No tuning required. Broadband response flat 1 MC to 55 MC at power levels of 5 watts to 5 KW.
- New variable sweep control for transmit and receive.
- RF attenuator controls height of pattern. Calibrated in 3 DB steps.
- Function selector for ENVELOPE, TRAPEZOID and BOW-TIE patterns on transmit. For SSB, DSB, AM and CW.
- Built-in 1 KC audio oscillator, less than 0.5% distortion. With 3" scope, is ideal for complete alignment of SSB exciters.
- For use in series with 52-72 ohm coax lines. A short pickup antenna may be used with other systems.
- Plug-in adaptors available to match 50 KC, 60 KC, 80 KC or 455 KC receiver IF systems. Only one simple connection to receiver.

MM-2 Kit ... (less IF adaptor). $119.50
Wired ... (less IF adaptor). $149.50
Plug-in IF adaptors (wired only) .....
RM-50 (50 KC), RM-80 (60-80 KC),
RM-455 (450-500 KC)... ea. .. $12.50

THERE IS NO SUBSTITUTE FOR A SCOPE IF YOU WANT THE CLEANEST, MOST PERFECTLY MODULATED SIGNAL YOUR TRANSMITTER CAN PROVIDE. THE MM-2 IS BY FAR THE MOST DEPENDABLE and EASIEST TO USE, SINCE IT WAS DESIGNED STRICTLY FOR THIS PURPOSE.



OTHER FINE C.E. PRODUCTS

Model 600L	Broad-Band Linear Amplifier	$495.00
*Model 20A	Bandswitching SSB Exciter	$299.50
*Model 10B	Multiband SSB Exciter	$193.50
*Model GC-1	Gated-Compression Amplifier	$ 66.50
*Model B	Sideband Slicer with Q Multiplier	$104.50

* Also available in kit form
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For further information, check number 58, on page 126

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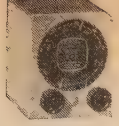
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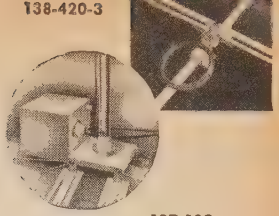
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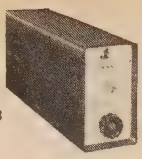
250-43

137-102

"6N2" VFO—Replaces 8 to 9 mc. crystals in frequency multiplying 6 and 2 meter transmitters. Output range: 7.995 to 9.010 mc. With tubes and power cable.

Cat. No. 240-133-1..Kit.....**Amateur Net $34.95**
Cat. No. 240-133-2..Wired and tested.....**Amateur Net $54.95**

"6N2" CONVERTER—Instant front panel switching from normal receiver operation to 6 or 2 meters. Available in following ranges: 26 to 30 mcs., 28 to 30 mcs., 14 to 18 mcs., or 30.5 to 24.5 mcs. With tubes.

Cat. No. 250-43..Kits.....**Amateur Net $59.95**
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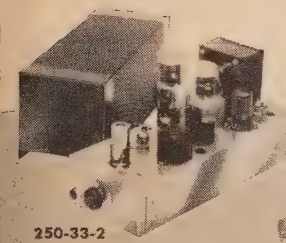
PRE-TUNED BEAMS—Rugged, semi-wide spaced with balun matching sections. 3 elements, boom and balun.

Cat. No. 138-420-3..20 Meters.....**Amateur Net $139.50**
Cat. No. 138-415-3..15 Meters.....**Amateur Net $110.00**
Cat. No. 138-410-3..10 Meters.....**Amateur Net $ 79.50**

"MATCHSTICK"—Fully automatic, pre-tuned vertical antenna system. Bandswitching 80—10 meters. Remotely motor driven. With 35' mast.

Cat. No. 137-102..Pre-tuned.....**Amateur Net $129.50**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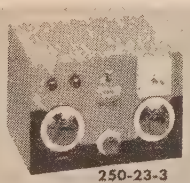
250-20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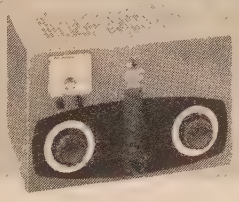
250-28

250-25

250-37

250-38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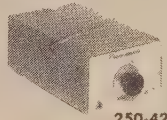
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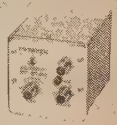

250-39

VIKING AUDIO AMPLIFIER—Self-contained 10 watt speech amplifier, with power supply and tubes.

Cat. No. 250-33-1..Kit.....**Amateur Net $73.50**
Cat. No. 250-33-2..Wired and tested.....**Amateur Net $99.50**

LOW PASS FILTER—Wired and pre-tuned.

Cat. No. 250-20..52 Ohms Impedance.....**Amateur Net $14.95**
Cat. No. 250-35..72 Ohms Impedance.....**Amateur Net $14.95**

CRYSTAL CALIBRATOR—Provides accurate 100 kc check points to 55 mc. With tube and crystal.

Cat. No. 250-28..Wired and tested.....**Amateur Net $17.95**

"SIGNAL SENTRY"—Monitors CW or phone signals up to 50 mc. With tubes.

Cat. No. 250-25..Wired and tested.....**Amateur Net $22.00**

T-R SWITCH—Instantaneous break-in on SSB, DSB, CW or AM. With tube, power supply and provision for RF probe.

Cat. No. 250-39..Wired.....**Amateur Net $27.75**

"MATCHBOXES"—Completely integrated antenna matching and switching systems for kilowatt or 275-watt transmitters. Bandswitching 80 through 10 meters.

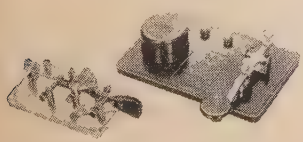
Cat. No.	Amateur Net
250-23-3..275 Watts, with directional coupler and indicator	$86.50
250-23..275 Watts, less directional coupler and indicator	$54.95
250-30-3..Kilowatt, with directional coupler and indicator	$149.50
250-30..Kilowatt, less directional coupler and indicator	$124.50

DIRECTIONAL COUPLER AND INDICATOR—Provides continuous reading of SWR and relative power in transmission line.

Cat. No. 250-37..Coupler.....**Amateur Net $11.75**
Cat. No. 250-38..Indicator.....**Amateur Net $25.00**

ATTENUATORS—Provide 6 db attenuation with required power dissipation to enable various units to serve as exciters for Viking "Thunderbolt".

Cat. No.	Amateur Net
250-42-1..For Viking "Ranger" or similar	$21.50
250-42-3..For use with HT-32 or similar unit	$21.50



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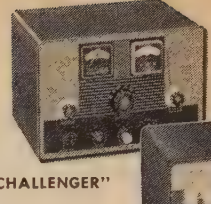
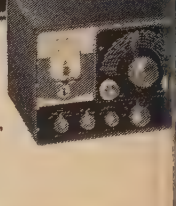
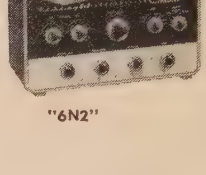


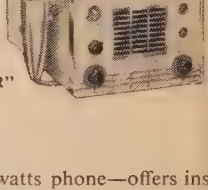
"CHALLENGER"



"NAVIGATOR"



"6N2"



10-METER "MESSENGER"

"ADVENTURER" TRANSMITTER

Self-contained . . . 50 watts CW input . . . rugged 807 transmitting tube . . . instant bandswitching 80 through 10 meters. Crystal or external VFO control—wide range pi-network output—timed sequence keying. With tubes, less crystals.

Cat. No. 240-181-1 . . Kit . . . . . **Amateur Net $54.95**

"CHALLENGER" TRANSMITTER

70 watts phone input 80 through 6; 120 watts CW input 80 through 10 . . . 85 watts CW on 6 meters. Two 6DQ6A final amplifier tubes. Crystal or external VFO control—TVI suppressed—wide range pi-network output. With tubes, less crystals.

Cat. No. 240-182-1 . . Kit . . . . . **Amateur Net $114.75**
Cat. No. 240-182-2 . . Wired . . . . . **Amateur Net $154.75**

"NAVIGATOR" TRANSMITTER/EXCITER

40 watts CW input . . . also serves as a flexible VFO Exciter. 6146 final amplifier tube—bandswitching 160 through 10 meters. Built-in VFO or crystal control. With tubes, less crystals.

Cat. No. 240-126-1 . . Kit . . . . . **Amateur Net $149.50**
Cat. No. 240-126-2 . . Wired . . . . . **Amateur Net $199.50**

"6N2" TRANSMITTER

Rated 150 watts CW and 100 watts phone—offers inst bandswitching coverage of both 6 and 2 meters. Fully suppressed—may be used with the Viking I, II, "Rang "Valiant" or similar power supply/modulator combi tions. Operates by crystal control or external VFO w 8-9 mc. output. With tubes, less crystals.

Cat. No. 240-201-1 . . Kit . . . . . **Amateur Net $129**
Cat. No. 240-201-2 . . Wired . . . . . **Amateur Net $169**

10-METER "MESSENGER" TRANSCEIVER

Complete 10-tube (including rectifier) crystal-control transceiver. 10 watts input—pre-tuned for 29.4 to 29.7 m —covers any 5 frequencies within a 300 kc segment 10-meter band. Excellent receiver sensitivity and sel tivity. ANL, AVC, and positive-acting Squelch. W tubes, push-to-talk microphone, and crystals for natio calling and emergency frequency (29,640 kc).

Cat. No. 242-201 . . 115 V only . . . . . **Amateur Net $129**
Cat. No. 242-202 . . 115 V and 6 V . . . . . **Amateur Net $139**
Cat. No. 242-203 . . 115 V and 12 V . . . . . **Amateur Net $139**

"RANGER" TRANSMITTER/EXCITER

This popular 75 watt CW or 65 watt phone transmitter will also serve as an RF/audio exciter for high power equipment. Completely self-contained—instant bandswitching 160 through 10 meters! Operates by built-in VFO or crystal control. High gain audio—timed sequence keying TVI suppressed. Pi-network antenna load matching from 50 to 500 ohms. With tubes, less crystals.

Cat. No.	Amateur Net
240-161-1 . . Kit	$229.50
240-161-2 . . Wired and tested	$329.50

"VALIANT" TRANSMITTER

275 watts input CW and SSB (P.E.P. with auxiliary SSB exciter) 200 watts phone. Instant bandswitching 160 through 10 meters—built-in VFO or crystal control. Pi-network output matches antenna loads from 50 to 600 ohms. TVI suppressed—timed sequence keying—built-in low pass audio filter—self-contained power supplies. With tubes, less crystals.

Cat. No.	Amateur Net
240-104-1 . . Kit	$349.50
240-104-2 . . Wired and tested	$439.50

"FIVE HUNDRED" TRANSMITTER

Full 600 watts CW—500 watts ph and SSB. (P.E.P. with auxiliary S exciter.) Compact RF unit desig for desk-top operation. All exc stages ganged to VFO tuning—n also be operated by crystal cont Instant bandswitching 80 throug meters—TVI suppressed—high g push-to-talk audio system. W range pi-network output. With tu less crystals.

Cat. No.	Amateur
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240-500-2 . . Wired and tested	$94

DURIER" AMPLIFIER

ted a solid 500 watts P.E.P. input
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near amplifier; 500 watts CW or
watts AM linear. Self-contained
k-top package—continuous cov-
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nts: 5 to 35 watts depending on
de and frequency desired. TVI
pressed. With tubes and built-in
ver supply.

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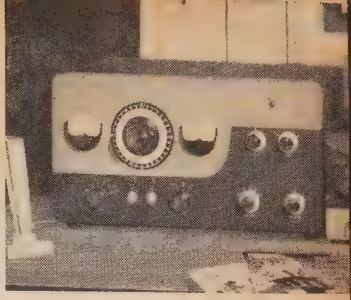
-352-2..Wired and tested...	$289.50

"THUNDERBOLT" AMPLIFIER

The hottest linear amplifier on the market—2000 watts P.E.P. (twice average DC) input SSB; 1000 watts CW; 800 watts AM linear. Continuous coverage 3.5 to 30 mcs.—instant bandswitching. Drive requirements; approx. 10 watts Class AB_2 linear, 20 watts Class C continuous wave. With tubes and built-in power supply.

Cat. No.	Amateur Net
240-353-1..Kit	$524.50
240-353-2..Wired and tested...	$589.50



"6N2 THUNDERBOLT" AMPLIFIER

1200 watts (twice average DC) input SSB and DSB, Class AB_1; 1000 watts CW, Class C; and 700 watts input AM linear. Continuous band-switched coverage on 6 and 2 meters. TVI suppressed. Drive requirements: approx. 5 watts Class AB_1 linear, 6 watts Class C CW. With tubes and built-in power supply.

Cat. No.	Amateur Net
240-362-1..Kit	$524.50
240-362-2..Wired and tested...	$589.50

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ING "KILOWATT" AMPLIFIER

only transmitter that provides maximum legal power in all des—SSB, CW, and plate modulated AM. Two 4-400A tubes Class AB_2 easily deliver 2000 watts P.E.P. (twice average DC) SSB mode—1000 watts input AM with two push-pull 810 tubes Class B modulator service—1000 watts input Class C CW. h efficiency pi-network output circuit. Excitation require-nts: 30 watts RF and 10 watts audio for AM; 10 watts peak SSB. Pedestal contains complete unit. With tubes.

No. 240-1000..Wired and tested.....**Amateur Net $1595.00**

tching desk-top and three-drawer pedestal.

No. 251-101-1.....**FOB Corry, Pa. $132.00**

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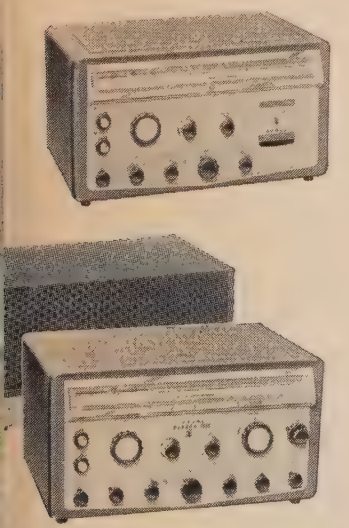

INVADER

The transmitter you've been waiting for—with more exclusive features than any other Transmitter/Exciter on the market today! Instant band-switching 80 through 10 meters—no extra crystals to buy—no retuning necessary. Rated 200 watts CW and SSB input; 90 watts input on AM. Unwanted sideband and carrier suppression is 60 db or better! Wide range pi-network output circuit. Fully TVI suppressed. Self-contained heavy-duty power supply. Wired and tested with tubes and crystals.

Cat. No.	Amateur Net
240-302-2	$619.50

INVADER-2000

Here are all of the fine features of the "Invader", plus the added power and flexibility of an integral linear amplifier and remote controlled power supply. Rated a solid 2000 watts P.E.P. (twice average DC) input on SSB; 1000 watts CW; and 800 watts input AM! Wide range output circuit (40 to 600 ohms adjustable). Final amplifier provides exceptionally uniform "Q". Exclusive "push-pull" cooling system. Heavy-duty multi-section power supply. Wired and tested with power supply, tubes and crystals.

Cat. No.	Amateur Net
240-304-2	$1229.00

HI-POWER CONVERSION

Take the features and performance of your "Invader"... add the power and flexibility of this unique Viking "Hi-Power Conversion" system ... and you're "on the air" with the "Invader-2000"—a solid 2000 watts P.E.P. (twice average DC) input SSB, 1000 watts CW and 800 watts input AM. Completely wired and tested—includes *everything* you need—no soldering necessary—complete the entire conversion in one evening!

Cat. No. 240-303-2..Hi-Power Conversion, complete.....**Amateur Net $619.50**

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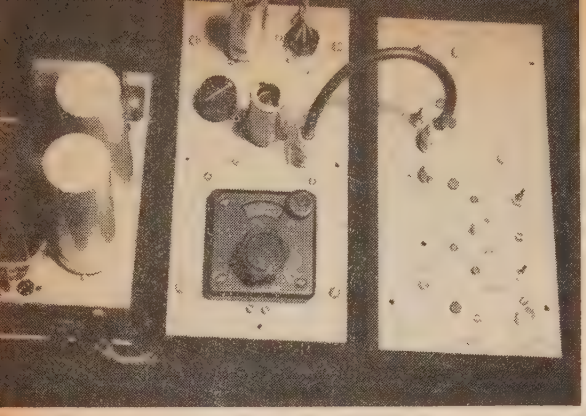


Photograph showing power supply on the left, pump oscillator in the center, and parametric amplifier on the right. Next to the power plug at the rear of the pump oscillator is the 0B2 voltage regulator, to the right of the voltage adjust pot is the 6AF4 and pump oscillator output jack. The vernier dial tunes the oscillator frequency. The top view of the parametric amplifier shows the input and output connectors as well as the screws of the piston trimmers. The screw driver adjust pot below the pump oscillator input connector, is the bias control.

A 222 Mc. Parametric Amplifer

Frank C. Jones, W6AJF
850 Donner Ave.
Sonoma, California

It is now well known that serious DX work at V.H.F. requires a low noise listening device. We present here a parametric amplifier built by W6AJF which should provide a noise figure of 1 to 2 db and enlighten many on low noise receiver construction.

PARAMETRIC amplifiers in the 220 *mc* band will provide a better noise figure than any available vacuum tube amplifiers such as 6AM4's, 417A's or a 416B's. A better n.f. means better reception of weak or fading signals whether the radio path is via tropospheric opening, meteor trail reflections, or moon bounce. Even for short distances of 50 to 100 miles where the signals may be of weak intensity, a parametric amplifier can be used to advantage. If the 220 *mc* receiver or converter happens to have a 6 or 7 *db* noise figure, then the approximately 1 db n.f. of a parametric amplifier shows up as a startling increase in signal readability.

Parametric vs Conventional

Another factor in favor of parametric amplifiers at 222 *mc* is the probability of improved life expectancy, as compared to 416A or 416B amplifiers. These tubes are usually rejects or surplus as far as amateurs are concerned (due to their excessive cost when new). Many amateurs using these little gold plated tubes on 222 or 432 *mc* have found that after a few weeks of operation, the noise figure has deteriorated from 1 to 2 *db* more than the original value of perhaps 3 *db* at 222 *mc* and 4 *db* at 432 *mc*. It seems reasonable to expect a set figure of 1 to 2 *db* for much longer periods of time with a parametric amplifier with no deterioration.

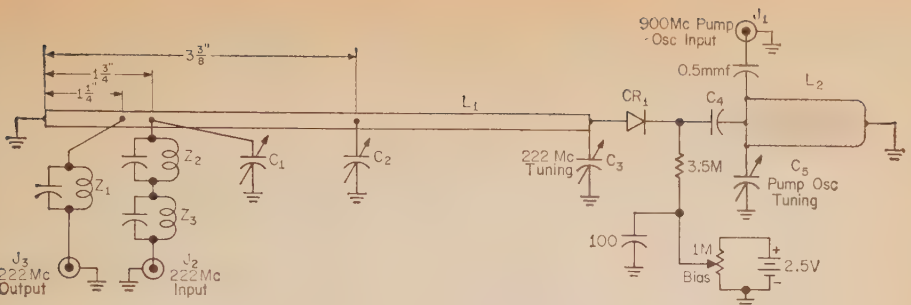
The parametric amplifier illustrated here was built, by the writer, for operation on 222 *mc* at KH6UK's station in the Hawaiian Islands for tests primarily to W6NLZ in Southern California.

Why 222 Mc

For those who are wondering about 222 *mc* in stead of the usual low edge of the band near 22 *mc*, the answer is the horrible noises from televisio receiver tuning oscillators all over that end of th band. At any location where channel 7 TV statio reception is possible, as many as several dozen T receiver oscillators may be heard up to as high a 221 or 221.5 *mc*. Apparently the average TV re ceiver will cover several hundred feet in distance i level terrain and much more in elevated location

Parametric Amplifier Construction

The 222 *mc* unit shown in fig. 1 was designed t fit into a 4 × 8 × 2 inch aluminum chassis as shielding box. A 4 × 8 inch aluminum sheet wa used as the mounting base and since the 222 *m* line circuit was too long for the box, it was folde around the side and a shield partition fastened i along the center so as to make a "square coaxial cavity 2 inches wide and deep when the unit is i its chassis box. A piece of copper tubing ¼ inc diameter and 9 inches long (L_1) was mounted o stand-off insulators so as to be nearly centered i the 2 × 2 inch space. The last inch of this line i bent down at right angles and soldered to a coppe sheet about 2 × 3 inches in size to act as a ground ing plate which would have lower resistance tha the 4 × 8 inch aluminum plate. A similar thin cop per plate could be used under the pump oscillato flat plate line. Probably a thicker, single, 4 × inch copper plate, preferably silver plated, would be a simpler solution to low resistance r.f. groun connections.



C_1—1100 *mc* idler tuning, 0.5—3.0 mmf glass piston variable, Erie 682026.

C_2—680 *mc* idler tuning, 0.5—3.0 mmf glass piston variable, Erie 682026.

C_3—222 *mc* tuning, 0.5—3.0 mmf glass piston variable Erie 682026.

C_4—.001 mf button mica, Erie 370-CB-102K (see fig. 2).

C_5—900 *mc* pump input tuning, 0.7—4.5 mmf glass piston variable, JFD Type VC2 (see fig. 2).

CR_1—Varactor diode Hughes Products, HPA-2800.

J_1, J_2, J_3—BNC Type coax connectors.

L_1—¼" d. × 9" silver plated copper tube formed as described in text.

L_2—See text and fig. 2.

Z_1, Z_2—680 mc idler frequency traps, 2 turns #20 tinned on 3 mmf Erie "Ceramicon" (see text).

Z_3—900 *mc* pump frequency trap, 1½ turns #20 tinned on 2 mmf Erie "Ceramicon" (see text).

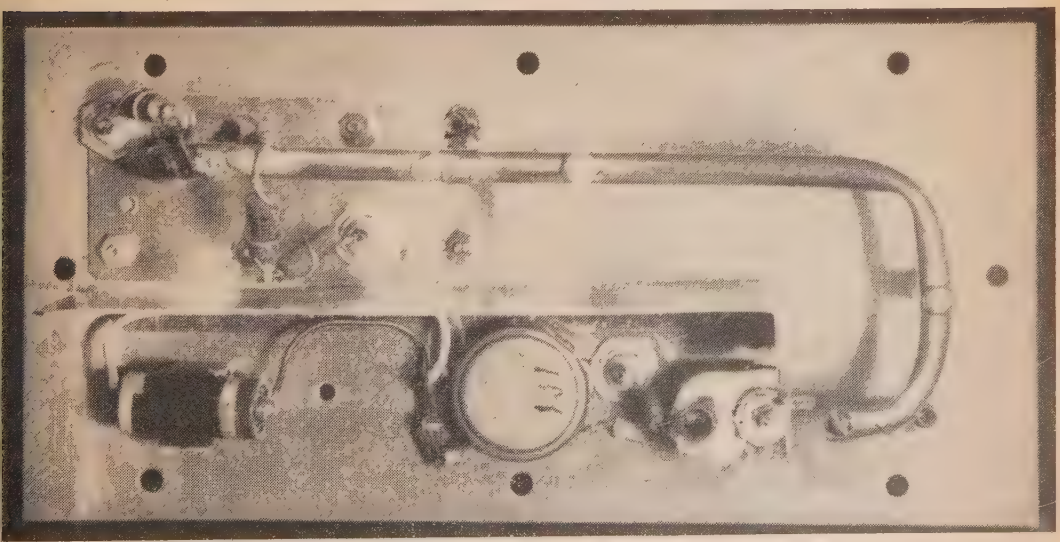
Fig. 1—Diagram of a 222 *mc* amplifier. The 9 inch copper tube is bent to fit inside a 4 × 8 × 2 inch chassis. The oscillator and idler frequency traps are discussed in the text.

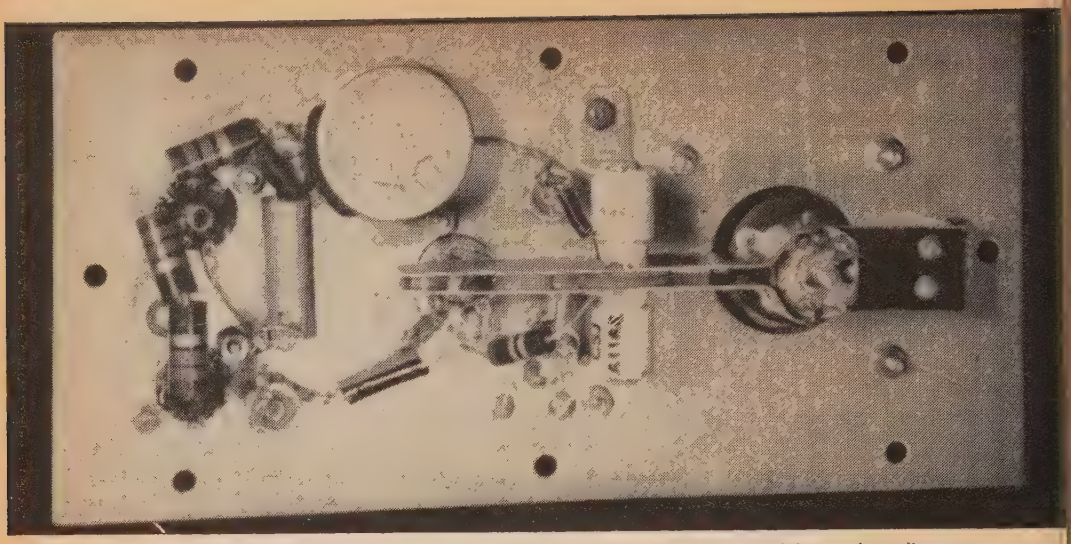
The 222 *mc* line is less than a quarter wavelength because of the capacity loading at the ungrounded end. The varactor diode capacitance of 1 to 2 mmf and small tuning capacitor of 0.5 to 3 mmf (C_3) shorten the line from about 13 inches down to 9 inches. The system was designed for a 900 *mc* pump oscillator which meant that an idler frequency circuit near 680 *mc* must be provided to dissipate this component (900 — 222 *mc*). To insure resonance in the 222 *mc* line at the idler frequency of about 680 *mc*, one or two small tuning capacitors are needed down near the grounded end of the line. It can be done with one 0.5 to 3 mmf piston type variable condenser (C_2) connected from ground to the line 3⅜ inches from the grounded end of the line. Another similar condenser (C_1) was connected to the line at 1¾ inches from the grounded end in order to check for tuning at the upper idler frequency of around 1100 *mc* but its practical use seems to be to help tune to the lower idler frequency and perhaps to the second harmonic frequency (900 × 2 — 222 = 1578 *mc*).

Pump Frequency

When the pump frequency is not a great many times the signal frequency, the noise figure can be

Bottom view of the parametric amplifier showing location of parts and shielding techniques. The copper tubing is bent down at the upper left and soldered to the copper plate, which is fastened to the chassis. Oscillator trap and idler frequency traps can be seen mounted to their respective coaxial connectors. Pump oscillator input connector, piston capacitor and button coupling capacitor are located to the right of the bias potentiometer. The parametric diode can be seen as a small glass cylinder connected between the end of the ¼ inch copper tube and the button capacitor.





Bottom view of the pump oscillator showing construction of the plate and grid lines. These lines are soldered directly to the 6AF4 tube socket pins and are neatly formed around the butterfly tuning capacitor at the right. Ceramic insulators are used, in conjunction with a good v.h.f. insulator, to maintain proper spacing of the tuned lines. Power components are placed at the left.

improved if there is resonance at the higher idler frequency such as the 1578 *mc* component. This may explain why good noise figures can be obtained even in systems using a pump frequency of 2½ to 3 times the signal frequency. The crystal diodes suitable for parametric amplifiers are wonderful harmonic generators, several times as efficient as ordinary diodes in frequency multipliers. This means that in a parametric amplifier, the harmonics of the pump frequency may produce regenerative effects due to the new difference idler frequencies generated in combination with the desired signal, if there is a resonant impedance available at the new idler frequency.

Varactor Diode

A new Hughes Products parametric amplifier diode (CR_1) was used in this unit. It connects between the 222 *mc* line and the pump oscillator line through a d.c. blocking capacitor (C_4). This diode is so small it doesn't show up very well in the amplifier photograph. A few volts of reverse bias is desirable since this moves the "zero bias" capacitance of 2.5 mmf down to less than 1 mmf into the region where the diode functions when the pump oscillator is driving it. The amplifier is much easier to tune up with the addition of a few volts of reverse bias. In this amplifier a 2.5 volt mercury dry cell battery was connected across a 1 megohm potentiometer

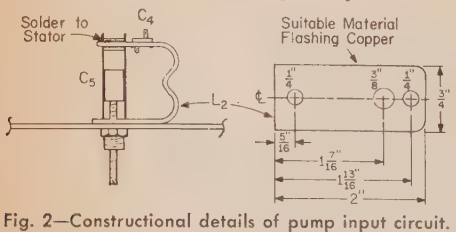


Fig. 2—Constructional details of pump input circuit. Flashing copper can be used for L_2 as well as for ground plates and pump oscillator grid-plates lines.

so any voltage from zero to 2.5 volts can be applied to the diode. If the battery polarity is incorrect direct current will flow through the diode and it will load the 222 *mc* circuit so heavily that the system will not function at all. With reverse bias, no appreciable current flows since the diode back resistance approaches infinity, for all practical purposes, up to the point of inverse peak voltage breakdown. (You then have a good noise generator). The back resistance is so high that a 5 or 10 megohm resistor can be connected in series with the bias voltage without affecting the voltage at the diode. A very high resistance here loads the diode less at signal frequency in its normal parametric operation. Use of less than several megohms is usually detrimental. The current drain on the mercury cell battery is only a few microamperes so several years service is indicated when operating continuously, so no ON-OFF switch was needed. The load on the battery is the 1 megohm potentiometer.

The pump oscillator input circuit of the amplifier should be of a high C low inductance design so it will have little detuning effect through the diode on the other circuit which tunes to the signal and idler frequencies. A piece of sheet copper 2 inches long and ¾ inches wide was used as the inductance (L_2). Near each end, a ¼ inch diameter hole was drilled in it for mounting the 1 to 5 mmf piston type variable capacitor (C_5). One end of the inductor is clamped to the 4 × 8 inch mounting plate by means of the piston capacitor mounting stud and nut. The other hole was soldered to the "stator" of the tuning capacitor, and a ⅜ inch diameter u.h.f. button by pass capacitor (C_4) was mounted near this top end. The center connection of the by pass capacitor connects to the diode and to the 3.5 or 5 megohm d.c. bias resistor. This line was a little too long at 900 *mc* so the center was slightly kinked back toward the glass cylinder of the tuning capacitor. This makes the line look a little like an accordion

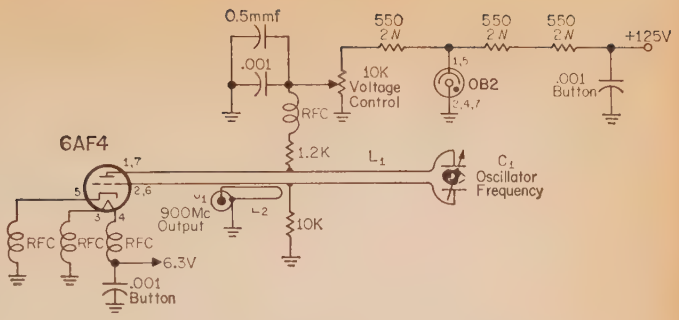


Fig. 3—Schematic of a pump oscillator, tuneable from 870 to 935 magacycles for use in conjunction with a 222 *mc* parametric amplifier.

C_1—1.5–3.0 mmf butterfly variable E. F. Johnson 3MB11.
J_1—BNC Type coax connector.
L_1—900 *mc* tuned lines ⅞" × 3¼" sheet copper spaced ⅛" as shown in photo (see text).
L_2—Hairpin loop #18 wire ⅛" wide and ¾" long. Mount under center of grid-plate lines L_1.
RFC—5 inches #24 wire, wound on 3/32" dia. form (see text).

instead of the usual U shape. The coaxial BNC panel fitting is capacity coupled to the top end of this 900 *mc* circuit through a small 0.5 mmf ceramic capacitor. From ¼ to ⅔ mmf here is suitable.

Piston Capacitor Modifications

The smaller piston type capacitors having a range of about 0.5 to 3 mmf had a wire lead to the stator. This was clipped off and ¼ inch thin copper strip soldered to the "stator" and to the copper tubing line circuit. At least two of these capacitors are needed to properly tune this line to the original and idler frequencies.

Idler Frequency Traps

The input and output 222 *mc* coaxial BNC fittings are connected to the line 1¾ and 1¼ inches from the grounded end respectively, through small idler frequency trap circuits. These trap circuits are a help in preventing the antenna and receiver coaxial lines from affecting the idler circuit impedances adversely. The two traps, Z_1 and Z_2, tuned to approximately the idler frequency of 680 *mc* consist of 3 mmf ceramic capacitors with the coil wound on the 3/16 inch ceramic covering of the capacitor. Each coil consisted of a piece of #20 wire 1¾ inches long, wound to make 2 turns around the capacitor. A little experimenting with this coil may be needed if the capacitors vary more than 10% of their marked value. The input jack, (J_4), being further up the line, has an added trap series circuit (Z_4) to help cut down pump oscillator radiation at 900 *mc* into the antenna circuit. It consists of one "long" turn of wire on a capacitor marked 2 mmf. The coil length should be adjusted originally to minimize 900 *mc* radiation when operating the whole system into a 900 *mc* receiver such as an APR-1 surplus 300 to 1000 *mc* receiver. The receiver coaxial line should connect directly into the antenna or input jack of the parametric amplifier with the pump oscillator turned on. This may be a needless refinement in some cases.

Pump Oscillator Construction

The pump oscillator consists of a separate unit (fig. 3) built on a 4 × 8 inch aluminum plate to fit a 4 × 8 × 2 inch aluminum chassis as a shielding box. A 6AF4A triode tube will oscillate in the 900 *mc* region with sufficient stability after a few minutes warm up. The circuit consists of a "half-wave" parallel plate line (L_1) made of sheet brass or copper 3¼ inches long, ⅞ inches wide and spaced about ⅛ inch apart except where it bends out to solder to the 5 plate butterfly tuning capacitor, C_1. The other end crosses over the tube socket plate leads and both grid leads of the socket are soldered directly to the lower edges of these parallel plates. At about the center of the line, a 10,000 ohm resistor ties from the grid line to ground, and a 1200 ohm resistor and r.f. choke in series connects from the plate line to the variable B+ supply. The latter consists of a 10,000 ohm potentiometer connected across an 0B2 regulator tube so as to get any voltage from 0 to 105 volts. The regulator tube can be eliminated in most cases if the supply voltage doesn't vary to greatly.

The oscillator tuning condenser (C_1) was mounted on a small piece of bakelite to insulate the rotor from ground, and an insulated coupling was put in between the rotor and the small vernier dial. The latter is an aid in setting the pump frequency to the optimum value near 900 *mc*. The range of the unit illustrated here is from 870 to 935 *mc*. The oscillator is voltage sensitive with respect to frequency, so when the potentiometer is varied to adjust the pump amplitude, the frequency dial has to be reset slightly in the original tune-up. The r.f. chokes in the plate, cathode and heater leads were made by winding 4 or 5 inches of #24 wire on a 3/32 inch drill as a form and the turns spread out slightly when slid off the winding form. The oscillator output coupling link was made of #18 wire bent to form a hair-pin ⅛ inch wide and about ¾ inch long near the lower edge of the grid-plate line.

Why Folded Line

The particular chassis dimensions used in this oscillator and amplifier were chosen in order to match the dimensions of a "Filter King" 220 *mc* converter into which the amplifier will normally be connected. The amplifier could be conveniently built into a 2 × 2 × 10 or 2 × 2 × 12 inch box to eliminate the bent copper line as had to be done in the unit shown in the photographs.

[*Continued on page 120*]

Remote Control For The Mark II Four Band Vertical DX Antenna

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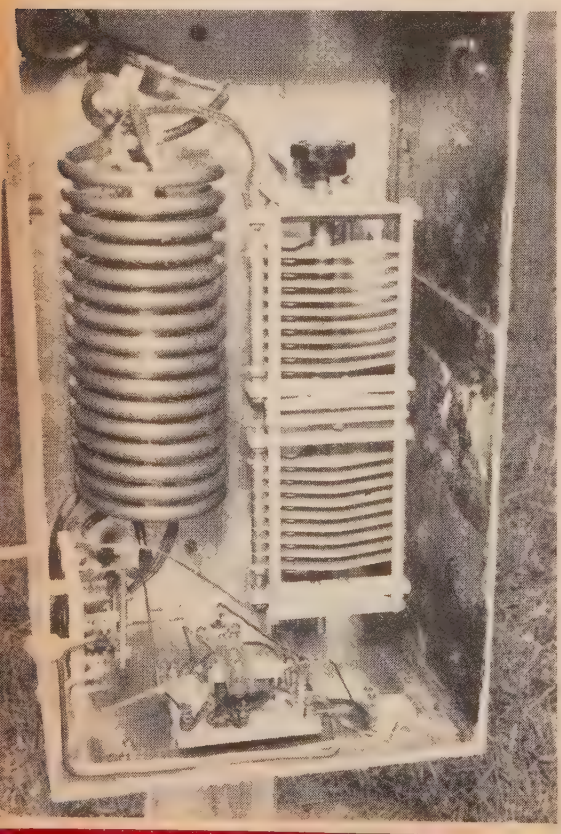
Kensington, Md.

One of the drawbacks in having a tuning unit out at the antenna is that long trek out behind the house to switch bands. Here's an idea that will save lots of walking and keep you as snug as a bug in a rug during a long winter storm.

Here is an added refinement which can easily be incorporated into the Mark II Four Band DX Antenna described in my article in a recent issue of *CQ*[1]. By means of two fairly heavy duty r.f. relays, an appropriate length of three-wire cable and a small control panel, band switching of the tuning unit can be done remotely from the operating position. This is a very handy modification, as it makes it unnecessary to go out in the snow or rain to throw the bandswitch, thus overcoming the only objection to this antenna. I made the modification during the antenna's annual summer overhaul.

[1]Lee, P. H. "The Four Band Vertical DX Antenna, Mark II," *CQ*, July, 1960, p. 28



View of the tuner housing with the cover removed showing placement of relays and wiring. It can be seen that the relays are mounted on standoff insulators to insure adequate insulation from the metal housing. The buried cable enters through a hole in the lower right corner of the box.

Kilowatt Relays

The circuit of the tuning unit, with the relay and remote control system, is shown in fig. The r.f. circuitry was not changed at all fro that shown in my previous article. However, th original four-position rotary switch was re moved, and two relays were installed in the bo tom of the tuning unit as shown in the photo graph. These relays are double-pole doub throw, Aemco Type 51, listed on page 198 Newark Electric's catalog No. 71 for 196 They are rated by the manufacturer to handle kilowatt, and have 115 volt a.c. coils.

Relay Modification

I found it necessary to make a slight modifi cation of the relays to prevent arc-over at th contacts. This modification, shown in fig. consists of raising the normally closed uppe contacts by inserting 6-32 nuts under them, pro viding additional clearance between upper an lower contacts and providing increased arma ture swing. This is necessary to prevent arc-ove at K_2, where high r.f. voltage exists betwee upper and lower contacts, especially on 3.9 *m* If you intend to run low power, this modificati may not be necessary, but in my case, K_2 d arc at an average kilowatt input to my 4-1000A Relay K_1 did not arc over, but I modified it an way, just in case. There should be definite con tact pressure in both the normally open an normally closed positions of these relays, with slight wiping action occuring between fixed con tacts and armature, keeping the contacts clean The spring tension should be increased as muc as possible for positive relay action.

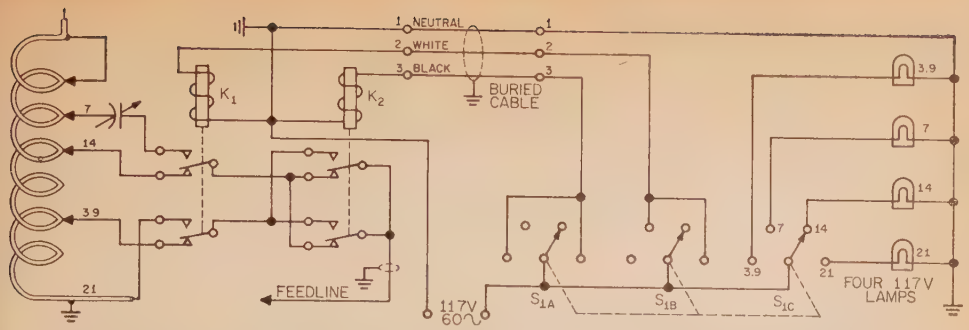


Fig. 1—Schematic of a remote control unit for a vertical antenna previously described in CQ. The switch and relays are discussed in the text. When both relays are de-energized the tuner is set on 14 *mc*. When K_1 only is energized it is switched to 7 *mc*. If only K_2 is energized the tuner is switched to 3.9 *mc*. When K_1 and K_2 are energized simultaneously the tuner is switched to 21 *mc*.

It is necessary to mount these relays on small bushings about a half inch high, to provide clearance between the relay and the housing. The screw heads on the terminals of these relays are counter sunk less than 1/16 inch into the bottom of the ceramic base. If the relays are mounted right on the metal housing, arcs and short circuits will result. The phenolic spacers which come with the relays are not satisfactory for r.f. use.

Underground Cable

The cable I used is a 3 conductor plastic covered type, easily obtainable from an electrical supply store, and is designed for underground burial. It has two #14 insulated conductors and one ground wire. It is buried about six inches underground from the tuning unit to the house. It terminates at the operating position in a standard three-prong polarized twist-lock receptacle which is mounted in an electrical outlet box in

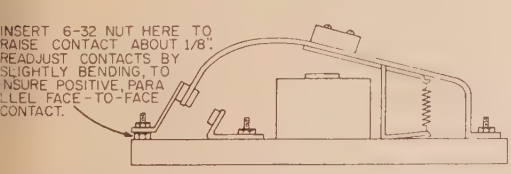


Fig. 2—Side view of relay showing position of the additional 6-32 nut on the normally closed contact. The additional gap is required for high power installations.

the wall behind the desk. One must be sure to connect the ground side of the control circuit to the ground side of the 115 volt power line, or blown fuses will result. In my case, the antenna control circuit is permanently connected to the transmitter control system, and power is applied when the main transmitter circuit breaker is closed.

It will be noted that when both relays are in the de-energized position, shown in fig. 1, the normally closed contacts connect the transmission line to the 14 *mc* tap on the tuning coil. This was done intentionally, so that with no power applied to the control circuit I can use the antenna for receiving 20 meters. The 14 *mc* band is the one that I use most during daily operations, so it is fortuitously convenient to leave the relays in the unenergized position for this band.

Control Panel

The control panel is a standard 1¾ by 19 inch aluminum rack panel. Four 115 volt indicator lamps are mounted on it, along with a 3 pole 4 position rotary switch. The switch is a miniature type, Grayhill No. 5-003-4. These miniature switches are rated to carry 5 amperes at 115 volts, and are ideal for situations like this one where the 1¾ inch panel does not present sufficient clearance for a larger type. The control pane lis mounted in a space, formerly vacant, beneath the single sideband exciter, as may be seen in the photograph. I wired the switch and lamps so that the lighting of the lamps from left to right corresponds to clockwise switch positions, in order from 21 to 3.9 *mc*.

A Word of Warning

It was not necessary to readjust any of the taps on the tuning coil after substitution of the relays for the rotary switch. The v.s.w.r. did not change from its previous value on any frequency. Needless to say, switching should never be attempted with r.f. power applied. Serious arcing and damage to the transmission line and transmitter components could result, especially with high power.

The hole, formally occupied by the rotary switch, was plugged with a dummy ¼-20 bolt, and the power cable entrance bushing was plugged with sealing compound. The whole tuner housing was repainted and the antenna was again ready for service.

It is a pleasure to be able to switch bands without getting up from the operating console. It certainly will be the means of my getting on 7 and 3.9 *mc* more often when I happen to tune across those bands and hear old friends talking. Just turn the antenna bandswitch, set the transmitter dials to pre-calibrated positions, and away we go! See you on all bands, fellows! ■

Parasitics: Their Symptoms, Causes and Cures

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Burlington, Mass.

Nary a single ham can look himself straight in the eye and say he's never had trouble with parasitic oscillations. If you're among the multitude of feather fanciers that appreciate birdies locked up in cages and not in chassis, we suggest you will find the solution of your problem below.

KEY clicks, rough notes, distorted modulation, extra carriers, stray sidebands, and cranky equipment are all vestiges of the same thing: parasitic oscillation. A parasite is an unwanted signal generated by an amplifier during a portion or all of its operating cycle. It may be of such cowardly nature as to take over the amplifier only in the absence of the desired signal, with its effect perhaps appearing as an occasional key click. On the other hand it may have enough gumption to hold forth at all times, grudgingly sharing the amplifier with the carrier.

Just as fire, to be sustained, requires fuel, oxygen, and kindling temperature, so oscillation—be it parasitic or desired—requires a resonant energy-storing "tank" circuit, gain, feedback impedance, and a feedback path as shown in fig. 1. Loss of

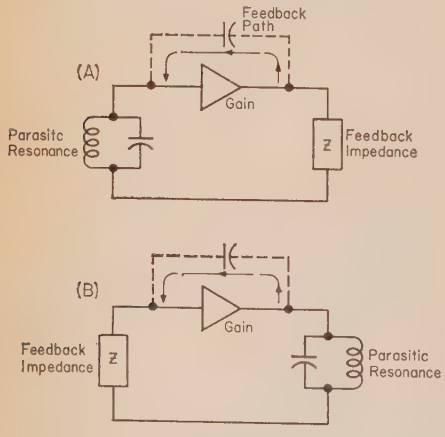


Fig. 1—Two circuit forms that will cause parasitic oscillation.

any of these factors will quell the disturbance. In the more usual oscillator circuits the feedback impedance is combined in the frequency determining network. With "accidental" oscillators the effect is nearly always of the tuned-grid-tuned-plate variety, with the screen occasionally participating as oscillator plate.

Oscillation occurs when too much of an ampl fier's output energy finds its way back into the in put. The general approaches in stopping this are 1) neutralize or offset the feedback path with second out-of-phase path, 2) break down the of the parasite's resonant circuit, 3) reduce th feedback capacity or coupling, 4) reduce the re sponse of the amplifier in the frequency range o the sham signal, 5) bypass the feedback impedan in the case of v.h.f.

The weapons we take on safari are a simp neon bulb, the station receiver, and perhaps v.h.f. wavemeter. The neon may be an NE-2 wi a 3 inch, #14-solid tinned wire probe soldered one of its base contacts. The brass ferrule shou be covered with several layers of Scotch electric tape. These steps should aid in keeping the pinki uncooked. The absorption wavemeter may be a gr dipper without plate voltage. Alternatively, it migh take the form of fig. 2.

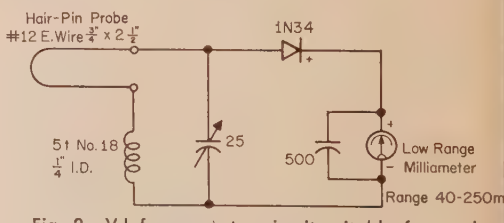


Fig. 2—V.h.f. wavemeter circuit suitable for tracking down parasitics.

Beating The Bushes

Before getting down to the soldering-gun-inhal stage, Bill Orr's classic article[1] should be read ar digested. In lieu of this, pages 365-368 in his *Rad Handbook*, 15th edition, are recommended. Pr paring the delinquent stage for the bird hu amounts to reducing plate voltage to about on third of rated, inserting any additional mete requisite to monitoring both screen and plate cu rents, disabling r.f. drive, and reducing the gr bias until the stage is pulling about half of rate

[1] Orr, W. I., "Persuit and Elimination of Parasites," C Dec., 1950, p. 24.

plate current. This is enough to encourage nearly all birdies to come out of hiding. Initial snooping should be done with one hand near the high-voltage KILL switch. Unstable amplifiers like to burst into oscillation and sometimes draw damaging currents before they can be turned off.

Identifying the Specie

Parasitics may be generated at widely differing frequencies, and as their causes and cures are dependent upon this, we should look into them in order of frequency. With the rig set up as outlined above we may begin our determination of the bird's specie by probing around with our "wide-wide-range frequency indicator," the neon bulb. A bright yellow near the glass shows the bird to live in the vicinity of 95-135 kilocycles. A quick look across the broadcast band with b.f.o. on should discover very rough but fairly stable harmonics of the critter.

If the amplifier is 'taking off' on or near its normal operating frequency, the plate current will fluctuate widely as the tuning controls are spun. The station receiver tuned to the ham band in question should locate a highly unstable carrier near (plus or minus 400 *kc*) the normal operating frequency. During tune-up the receiver may just give out with blips as the vagrant carrier goes flitting by. The neon bulb will show pinks and reds. An absorption meter should show r.f.

If the main carrier is rough at some transmitter settings, there are intermittent key clicks, particularly virulent TVI, the tuning meter flicks around in an erratic manner but no spurious signals can be found with the receiver, then the safari must turn North into tiger country. This bird is of v.h.f. nature. The neon will glow with a deep purple, close to the electrodes, but in some cases the oscillation may cease when the probe touches part of the guilty circuit. This is where the more sensitive v.h.f. absorption meter comes in handy.

These then comprise the ranges to expect: approximately 100 *kc*; on or near the operating frequency; and perhaps 40 to 250 *mc*. Following are discussions and suggested cures for each variety of "beastie."

Very Low Frequency Oscillation

V.l.f. oscillations are probably the easiest to kill. They come about in an oscillatory circuit of the types shown in fig. 2. Almost without exception the "tuned circuits" are r.f. chokes which have been resonated by their own turn-to-turn capacities, along with tube, bypass and stray *C*. The offending stage will normally have two chokes; one someplace in the grid or preceding plate circuit and the other in the plate.

The plan of attack is to eliminate either one of the chokes or make it appear electrically, so different, as to "tune" it to some other natural frequency. We may eliminate grid chokes in many low-level stages by replacing them with 10,000 ohm resistors. If the output is reduced too much, check the number of pies on the chokes and use a 3 pie unit in the grid and 4 pie in the plate. (Remember, when you tune the plate capacitor of a simple crystal oscillator to the low frequency side of resonance, the oscillator quits.) Short of this, use 2.5 *mh* in the plate and 1.0 *mh* in the grid. The same effect may be had by pulling turns from the grid choke. This will reduce the drive on the low bands a little, but that is normally acceptable.

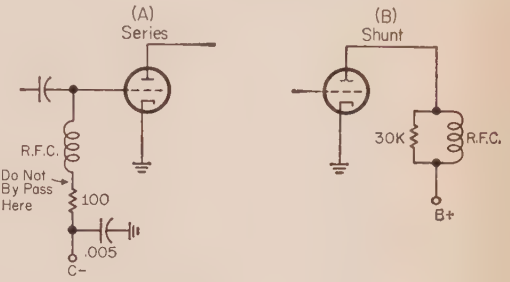


Fig. 3—Resistive loading of v.h.f. circuits reduces Q.

Figure 3 illustrates a method designed to load, or break the *Q* of the parasitic resonances. The resistor across the plate choke should be as small as possible, the limit being excessive heat dissipation. Start with 100K and reduce the value until this occurs. Incidentally, be sure to employ but one chassis ground connection per stage and return all bypasses and tuning capacitors to that common point.

One stubborn case of v.l.f. type key clicks succumbed only after it was noticed that the bleeder resistor in the 300 volt supply had opened. Its replacement ended two months of living in the exciter deck.

On-frequency birds that flit about the band during tune-up, resulting in unstable and embarrassingly loud signals outside the band, sometimes disappear when sufficient drive is applied. Just as often they collect FCC type fan mail and 'praise' from the ops well up the band. Neutralization is the answer! Difficult cases not yielding to the usual measures have been shot down by: 1) orienting grid coil axis 90° to that of the plate *L*, 2) shielding, 3) replacement of mica bypasses with ceramic units, 4) bypassing both sides of the filament, 5) use of short copper straps to and from the neutralizing capacitor(s). The *Handbooks* have beat this one into the ground.[2]

[2] *Radio Handbook*, 15th Edition, Sec. 13-6, p. 255.

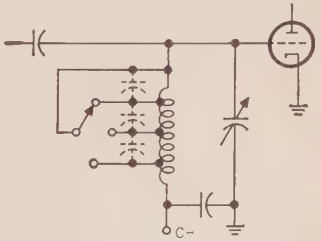


Fig. 4—Coil portions in the bandswitch may be resonated by distributed capacity and may be cured by shortening type switches.

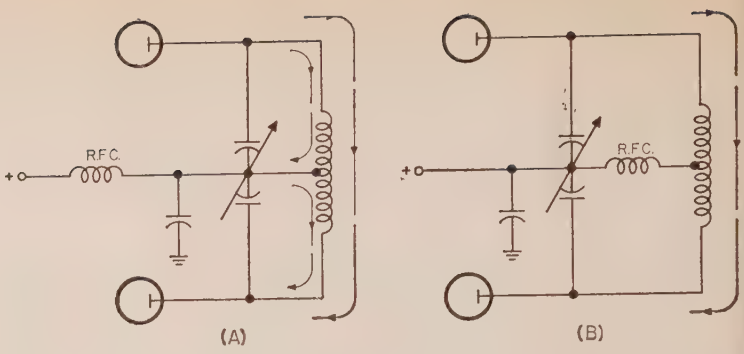


Fig. 5—Multiple resonances in the push pull circuit of A may be broken up by the proper placement of the r.f.c. as shown in B.

Very High Frequency Oscillation

Now let's get after the Very High Flyers. These resonant circuits come in two packages. One is the accidental resonance consisting of portions of coils, resonated by stray capacity. Some resonances in the circuit of fig. 4 may be avoided by using a shorting-type switch and short leads. Sneak resonances in a push-pull tank (fig. 5) can be broken up by rearrangement of components.

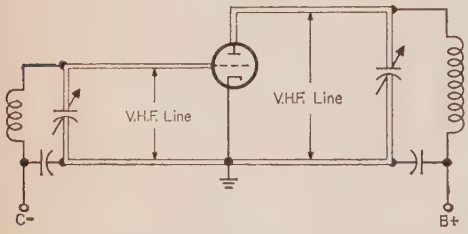


Fig. 6—A typical r.f. amplifier when looked at with a "v.h.f. eye" may appear as shown above. The reasoning is described in the text.

The more usual kind of culprit is the 'quarter-wave transmission line'. A look at the tuned-line oscillators in any handbook v.h.f. chapter puts the point across. The line section may be an innocent looking grid, screen, or plate lead and the chassis area near it. A typical r.f. amplifier, when inspected with an awareness of v.h.f. behavior may turn into something like fig. 6. It looks remarkably like the line oscillators in older A.R.R.L. *Handbooks*.

There are several stratagems which may be tried. The first and simplest is a small, e.g. 10 mmf, ceramic or air capacitor connected directly from grid or plate to cathode. The resonant line still exists but it is much shorter, and its resonant frequency should be above the range in which the tube will readily oscillate.

Some of these circuits can be broken up by inserting lossy elements to dissipate v.h.f. energy, i.e. 'load' the parasitic circuit. Several companies manufacture small chokes for this purpose, but as a commercial choke may require tailoring to the circuit in question, there is little reason not to roll your own. A 47 ohm 1 watt resistor wound with 3 to 10 turns of #18 enamel wire may do the trick. Start with 10 turns and trim to fit.

In low-current circuits such as audio and r.f. grids, receiver plates, etc., the resistor by itself is very effective.

Problems in Grounded Grid

So far we have employed decoupling, (bypassing) and raising of the line's natural frequency and lowering of its *Q* to quell the birdies. Following is a case in which a tempestuous grounded-grid stage failed to respond to any of the v.h.f. cures above.

Recently a 6146 was put to work as shown in

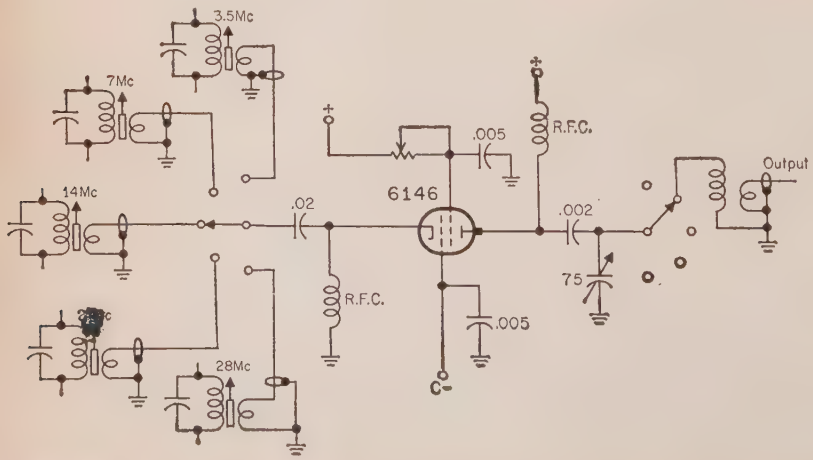


Fig. 7—The circuit of the multi-band grounded grid amplifier whose difficulties with parasitics are explained in the text.

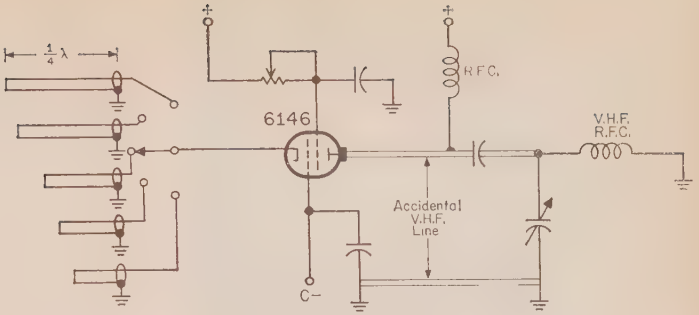


Fig. 8—The coax lines feeding the cathode were λ/4 length at each parasitic frequency.

ig. 7. As expected, firing it up brought forth a asty hiss from the plate choke. The neon bulb howed yellow when touched to either the cathode or plate, and the receiver found 115 *kc*-spaced harmonics through the lower bands. When the athode choke was replaced by a 300 ohm resistor he yellow glow disappeared, and in its place was he sickly purple of a v.h.f. bird. With rotation of he bandswitch 80 through 15, the parasite stepped ts way from 56 to 83 megacycles. The plate tuning capacitor would move the bird's frequency only bout 4 *mc*.

The parasitic chokes of the handbooks were all ried, with variations, at the plate terminal and ater at the cathode. The results were dishearteng. OK, if this fat ole bird wanted a fight . . . in vent a high-Q parallel plate trap. When the trap

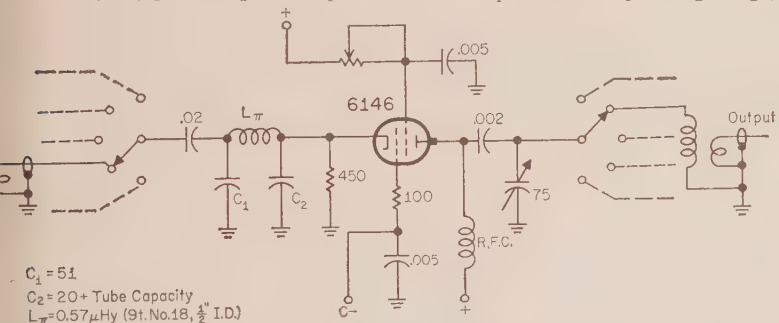


Fig. 9—Amplifier circuit after the treatment described in the text.

vas peaked to 56 *mc* the fiend showed its utter contempt by arcing across and ruining the trap rimmer. At this point a lifetime membership in he Captive Birdwatchers seemed a certainty.

It was time to *think!* The points of the second paragraph were mulled over and a 15 mmf mica capacitor was soldered from plate to cathode in n attempt to bypass the plate circuit's v.h.f. impedance. No dice! Several tries proved that as mall as 10 mmf *ceramic* would do the job. The nternal inductance of the mica had reduced its bypassing capability at v.h.f. Object lesson: bypass vith ceramic capacitors only.

The addition of this capacitor caused intolerable ffects when tuning 10 meters, so a better measure vas sought. If the plate tuning capacitor had so ittle influence on the parasitic frequency, then the parasitic tank circuit might be before the cathode! What was up front, counted! The coaxial lines beween the multiplier stages and the 6146 varied in ength and had turned the circuit into the Mr. Hyde of fig. 8.

Low Pass Filter

Several loading tricks were tried, but each lowered the drive to the amplifier. To stop this one, perhaps the fuel could be taken from the fire. Reference to McLaughlin's article[3] gave the input resistance as 90 ohms. Paralleling the cathode with a 450 ohmer would give a termination impedance of 75 ohms for the lines. We were on the right track at last. A pi section low pass filter with cut-off at 41 *mc* was installed between the cathode and the coax lines. This wrecked the v.h.f. response beautifully, yet had no effect on the ham band drive. It was immediately apparent that the birds had flown the coop (fig. 9).

Had the coax been longer and the parasitic been in the operating range, neutralization would have been necessary. An alternative attack would then have been to shorten the coax and carry on with the steps above.

The position of the pi-section seems to be ideal for attenuating harmonics arising from the multiplier stages that would normally ride through and appear in the plate load.

After a thorough checkout, the glow of achievement ebbed. Spinning the plate capacitor still showed a persistent 5-mil flicker of plate current. This was traced to the bypassed(!) grid lead. Presence of a neon bulb probe at the grid terminal was sufficient to kill this weakie. The wavemeter found him at 205 *mc*. Again, handbook-type suppressors were tried and discarded. One hundred ohms right at the grid produced a completely stable amplifier. The addition of the parasitic suppressor had only lowered the bird's frequency to 193 *mc*. The "losser" resistor ruined the line's *Q*. ■

[3] McLaughlin, N. R., "Input Impedances of Grounded-Grid Amplifiers," *CQ*, January, 1956, p. 23.

Front panel of the modulation analyzer. The six controls at the upper left are self explanatory, being normal 'scope controls. At the bottom, from left to right are the pilot light, receiver i.f. gain control, transmitter link tuning, C_1, input bandswitch, S_1, and transmitter input tuning, C_3.

Modulation Analyzer

Denys G. Frederickson, WØBMW
1709 So. Roosevelt,
Wichita, Kansas

No phone station worth its salt should be without a means of monitoring the modulation characteristics of its emitted signal. Here is a device that does not only that, but also analyzes the modulation characteristics of the received signal.

After the laborious process of using the regular lab oscilloscope several times to check percentage of modulation, it became very apparent to me that a modulation analyzer would be highly desirable. Then the thought arose that the Modulation Analyzer should also be able to check the modulation of the received signal as well.

With these goals in mind and determination as the motivating force, a program of headscratching was immediately launched. The headscratching soon developed into hairpulling and before long I was in orbit.

The input circuit of the "Moniscope" built by W7HEA[1] was used in the modulation analyzer. It consists of an automatic switchless electronic changeover from receive to transmit. This is accomplished by the fact that the resonance of the receiver and transmitter input circuits of the Modulation Analyzer, are widely separated with no noticeable interaction.

A wave envelope or trapezoidal pattern can be presented on the scope by the flick of a switch. The trapezoid pattern will have a bright spot at the apex of the pattern when the modulation is in excess of 100 percent. Modulation patterns are explained in the ARRL *Handbook*.

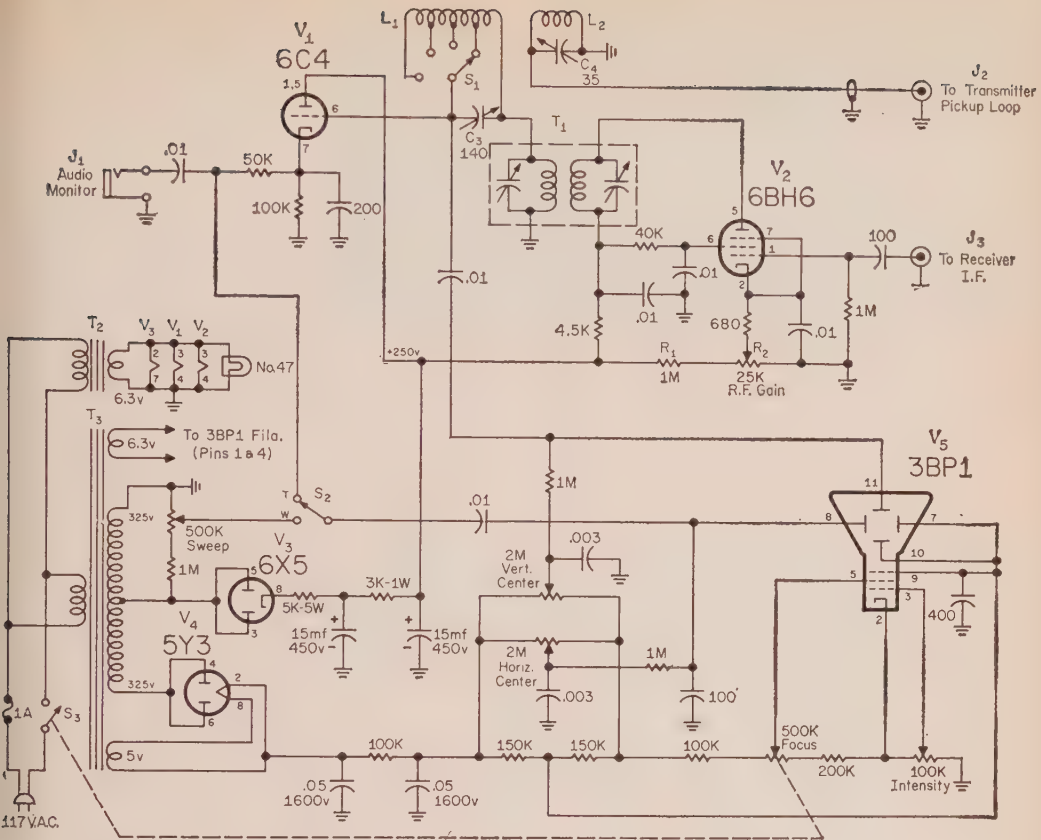
The Modulation Analyzer will give consta modulation monitoring. It will aid in eliminati splatter caused by over modulation and can used to zero beat another station.

The Circuit

By means of the bandswitch S_1 inductance and capacitor C_3, coverage from 3.5 to 60 *mc* obtained. Capacitor C_4 acts to shunt L_2 and gi a small degree of control over the signal bei coupled into the tuned circuit of L_1 and C_3. Ca citor C_3 has sufficient control to vary the amplitu over a wide range. The 6C4 is used as an infin impedance detector giving good linearity over la values of input signal voltage with very light loa ing on the tuned circuit.

With audio applied to the horizontal plates a S_2 in the TRAPEZOID position, the pattern will displayed on the c.r.t. A 60 cycle sweep voltage used for the horizontal deflection when S_2 is in t WAVE ENVELOPE position. The wave envelope p tern will give better results if an audio generat is employed.

1 "*CQ* Tests The Moniscope," *CQ*, November, 1956, p. 51.



C_3—140 mmf variable Hammarlund HF-140
C_4—35 mmf variable Hammarlund HF-35
J_1—Open circuit phone jack
J_2, J_3—R.C.A.-type phone jacks
L_1, L_2—See text
S_1—1 pole, 4 position rotary switch (Mallory 3215J)
S_2—S.P.D.T. toggle switch
S_3—S.P.S.T. on shaft of focus control
T_1—I.F. transformer to match receiver i.f.
T_2—Filament transformer 6.3 v. @ 1.2a. Stancor P-6134
T_3—Power transformer 650 v. c.t. @ 55 ma., 5 v. @ 2a., 6.3 v @ 2a. Stancor PC-8407

Fig. 1—Circuit diagram of the Modulation Analyzer.

Controls and circuit were designed so that the cture display was available with a limited number adjustments.

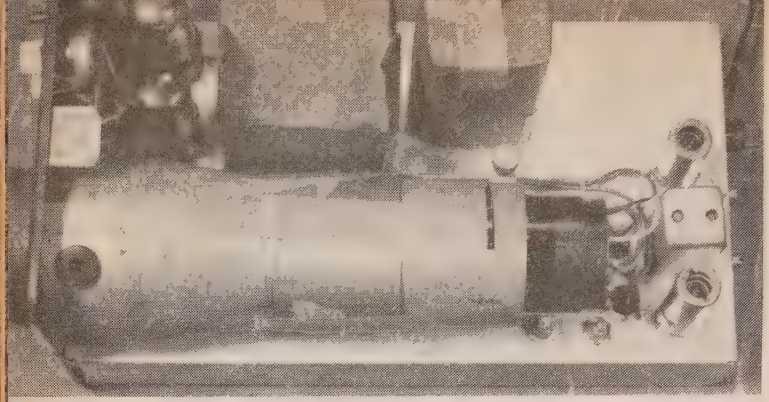
A question may arise concerning resistor R_1, hich is connected between the gain control R_2 d B plus. This little device will allow a smoother d broader control of the gain rather than having all bunched up on one end of the control. The N-OFF switch S_3 was placed on the focus control reduce the possibility of a burned spot on the r.t. should the unit be turned on inadvertently. his switch could also be used in conjunction with e r.f. gain control, sweep control or intensity.

One end of a 10 mmf capacitor should be con-cted to the plate of the last i.f. in the receiver. short length of RG-58/U should be used in the ceiver and connected to the other end of the 10 mf capacitor with the shield ungrounded at the ndenser end. Place the condenser as close to the ate connection as possible to minimize the de-ning effect on the receiver. Ground the other end the shield to the receiver chassis. The i.f. circuit in the Modulation Analyzer is not critical and can be used with most of today's receivers providing the i.f. transformer, T_1, is of the same frequency as the i.f. of the receiver.

The r.f. pickup loop from the transmitter consists of one or two turns of heavy wire with one end attached to ground and the other end attached to the center conductor of a suitable length of RG-58/U. The distance of the pickup loop from the final tank coil will have to be determined by trial. The signal can be audibly monitored through J_1, connected to the cathode of the 6C4.

Construction

Construction is not complicated in any way. There are, however, a few things that should be remembered. The power transformer should be located as far from the c.r.t. as possible to minimize the distortion caused by magnetic fields. It should be placed, preferably to the rear of the c.r.t. If, for some reason, the transformer must be located along side of the c.r.t. the magnetic cou-



Top view of the modulation anc
showing the 'scope power supp
the top. The 6BH6 i.f. amplif
at the right, above the i.f. can
the 6C4 detector below. The ma
taped on the transformers is
metal, as explained in the te

pling can be greatly reduced by rotating the transformer into a position which produces the least amount of coupling. The interference can be further reduced by proper placement of MU-metal shields over the transformer and around the c.r.t. MU-metal is a material which is highly effective for magnetic shielding. It was tried and found to work very satisfactorily.

The chassis dimensions recommended for a 3 inch c.r.t. are 13 × 7 × 2 inches. The front and back panels were made from sheet aluminum having the dimensions of 7¼ × 6½ inches. The case was made from a sheet of aluminum, bent to conform with the inside dimensions of the front and back panels. The case was attached to the rear panel by means of small angle brackets. A base plate of ⅛ inch aluminum with rubber feet attached, can be fastened to the bottom of the chassis with metal screws which also secures the case to the chassis.

L_1 and L_2

Inductors L_1 and L_2, can be made by using number 20 wire wound on a one inch diameter coil form. The coil should be 3 inches long and have 48 turns. Then L_2 can be made by cutting the 6th turn and the remainder of L_1 is tapped at the first, fourth and twelfth turns. A B&W Miniductor #3015 will work very well.

Operation

A few minutes spent on rechecking the wiring may save a few headaches. After connecting the unit to the receiver and transmitter, allow a few minutes for warm up. A spot should appear on the scope with no input from the receiver or transmitter. If a spot does not ap
adjust the HORIZONTAL, VERT
and INTENSITY controls until
spot is centered. Then adjus
FOCUS to obtain a small sharp
Turn the receiver on, and
S_2 in the TRAPEZOID position, grass, in the shap
a small trapezoid should be present. Adjust
i.f. of the Modulation Analyzer for maximum
flection on the c.r.t. with the receiver GAIN on
analyzer set at approximately 50 percent.
completes the adjustments for the received si

By adjusting the pickup loop at the transm
setting the selector switch, S_1, and C_3 combina
the desired amplitude can be obtained. Reme
to turn the transmitter off when working nea
final tank circuit. If sufficient amplitude is no
tainable, the pickup loop at the transmitter
have to be adjusted.

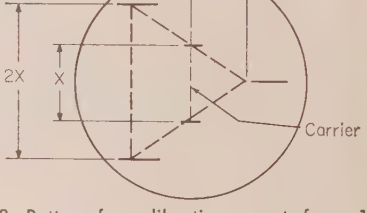
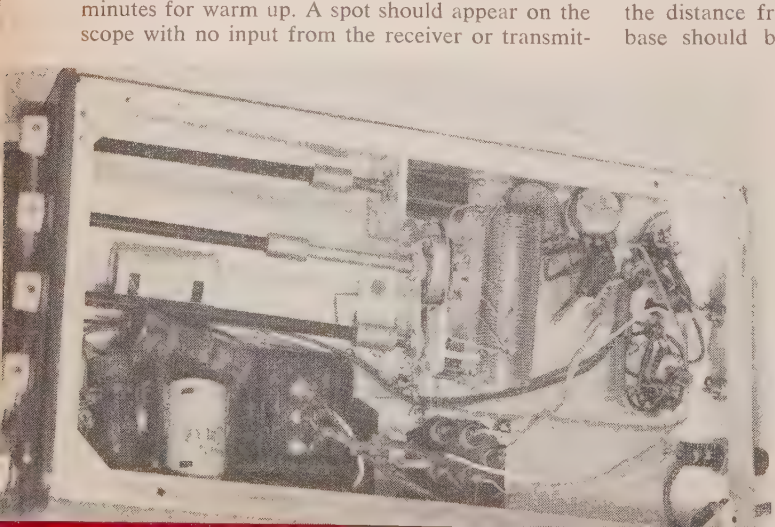


Fig. 2—Pattern for calibrating a c.r.t. for a 100
modulated signal.

The face of the c.r.t. may be marked as sh
in fig. 2. When a signal is modulated 100 pe
with no clipping, the excursion on either sid
the carrier should be the same distance (Y
other words, the distance from the carrier to
apex or point of the trapezoid should be equ
the distance from the carrier to the base and
base should be twice the height of the ca
(2×). When the apex of the t
zoid does not come to a point
signal is being negatively cli
or indicates less than 100 pe
modulation. It is not wise to
too heavily; need I say more?

The writer wishes to thank
Azim Studio, KØJEJ, for the
job of photographing the e
ment.



Bottom view showing mounti
L_1 and L_2. Capacitor C_4 and
S_1 are mounted on an L sh
bracket with C_3 insulated fro
chassis by poly. sheet. Jacks J_2
J_3 can be seen on the rear w
the chassis. Monitoring jack J_1
not included in this unit.

A Product Detector for the SX-100

Carl Habermann, K8AFW
3336 Sycamore Knoll Dr.
Columbus 19, Ohio

Improved S.S.B. and C.W. reception for the popular SX-100.

A product detector is a worth while addition to any receiver, especially for c.w. and s.s.b. reception. Many articles have discussed the advantages of the product detector. The circuit diagram of the SX-101A and SX-100 were compared and it appeared simple to add the product detector used in the SX-101A to the SX-100.

Figure 1, shows the circuit for the product detector and how to wire it into the SX-100. A socket for the 6BY6 was mounted between the 6BJ7 detector tube and the 1650 *kc* i.f. transformer, T_2. The original s.p.s.t. A.M./C.W.-S.S.B. switch was replaced by S_1, a d.p.d.t. bat handle toggle switch.

Wire filament power to pins 3 and 4 of the 6BY6 socket. Wire the product detector circuit and connect it to the receiver as shown by the dotted lines in fig. 1. Remove the parts and wires as shown by the lines with the X's. Replace the b.f.o. 100K grid resistor with a 47K resistor. Touch up the 50 *kc* i.f. transformer trimmer and the b.f.o. ZERO adjust and the set is ready to go.

All the resistors are ½ watt and the capacitors ceramic or mica except the two .1mf capacitors. Parts should be chosen for small physical size so that wiring is kept neat.

Operation

When the AM, CW-SSB switch is in the am position, operation is the same as before modification. Switching to the CW-SSB position applies plate voltage to the b.f.o. and switches the audio from the a.m. detector to the product detector.

Results

Receiver noise is reduced on c.w. Radio frequency injection level to the detector is not so critical for s.s.b. operation and distortion is reduced. More r.f. gain can be used allowing better a.v.c. action. The receiver has more apparent gain.

Mechanical stability of the receiver can be improved by the addition of a 2 inch thick polystyrene foam pad beneath the receiver. ■

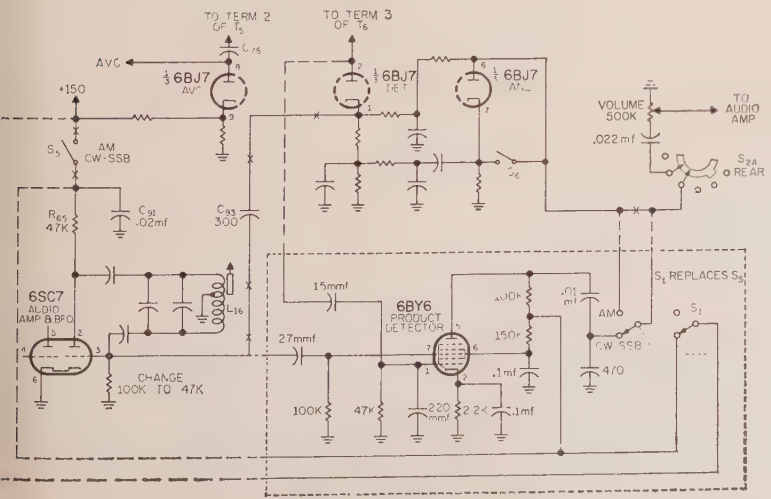


Figure 1. Circuit of a product detector with wiring instructions and modifications for addition to the SX-100.

Understanding Very-High-Frequency Antennas

Part I

Stanley Leinwoll
33 Cranston Road
Franklin Park, New Jersey

Part One of a series for the newcomer, or the old timer who admits he doesn't really know how that r.f. gets across town.

SUCCESSFUL radio communication depends, in addition to operating skill, good equipment, and a good antenna system, on a knowledge of the basic principles of radio wave propagation. Since delivery of a radio signal from a transmitter to a receiver as efficiently and consistently as possible is the objective of any communications system, an understanding of the medium through which the signal travels, the manner in which it travels, and the characteristics of the signal itself are desirable.

Therefore, an understanding of the basic principles of v.h.f. radio propagation will enable the reader to better understand concepts involving the design and performance of antennas operating in the bands above 30 megacycles.

Propagation

V.h.f. and higher frequency radio waves picked up at a receiving antenna may have arrived there via three distinct routes: the *ground wave*, the *sky wave*, or the *tropospheric wave*.

The ground wave consists of a *surface wave*, a *direct wave*, and a *ground reflected wave*, as shown in fig. 1. The latter two combine to produce a resultant *space wave*.

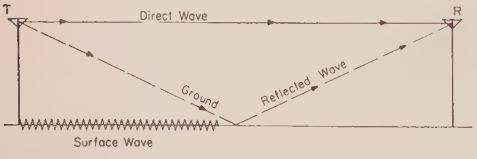


Fig. 1—Three components of a ground wave propagated v.h.f. u.h.f. signal. The surface wave attenuates rapidly. The direct and ground reflected waves combine at the receiving antenna, R, to form the Space wave.

The Surface Wave. In the v.h.f. and u.h.f. range, the surface wave, that part of the radio wave traveling along, and in contact with the ground, is very rapidly attenuated. Distance covered is very limited, depending on the type of terrain, being better over water than over land, and over soil with good conductivity rather than poor conductivity.

The Space Wave. The space wave travels through the lower regions of the troposphere. The troposphere is that part of the earth's atmosphere that extends from the surface of the earth to an altitude of approximately seven miles. Most of the earth's weather occurs in the troposphere.

Because of normal changes in the refractive index of the lower atmosphere, the space wave bends slightly, so that rather than travel a perfectly straight line, it curves slightly as shown in fig. 2(a). It has been found that if the earth's radius is multiplied by 1.33, a straight line approximation of the radio horizon can be obtained for a normal atmosphere. This is shown in fig. 2(b).

Although the mechanism of propagation of the space wave through the troposphere at distances up to and slightly beyond the radio horizon are well understood, it should be pointed out that a number of factors other than propagation are involved in determining how a circuit will perform or what coverage will be attained. Perhaps foremost among these is the elevation of the transmitting and receiving antennas above the ground. Since antenna ele

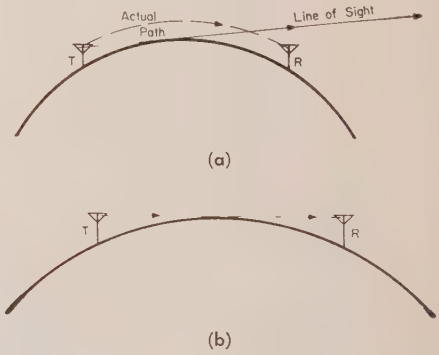
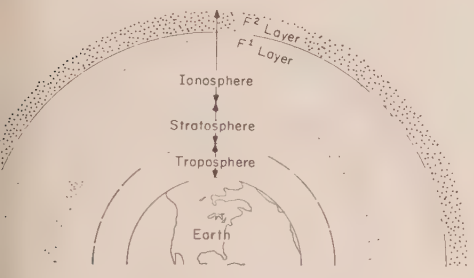


Fig. 2—As shown in (a), the space wave bends slightly in passage through the troposphere, rather than travel in a perfectly straight path. If the earth's radius is multiplied by 1.33, a straight line approximation of the radio horizon can be made. T and R are the same distance apart in (a) and (b).

ts at v.h.f. and u.h.f. frequencies range from
v feet to only inches in length, it is obvious that
rage can be increased by elevating the system
ve ground. Other factors that determine cover-
are intervening terrain (obstacle "shadows"
e considerable attenuation), transmitter power,
antenna directivity. The directivity of an an-
a system will determine the power gain when
smitting, and the effective "capture area" when
iving. Capture area will be discussed in some
il later on.

he Sky Wave. Dependent upon conditions in
onosphere, as well as the phase of the sunspot
e, a v.h.f. radio wave may be either "bounced"
he regular F_2 layer of the ionosphere, or "scat-
l" off the lower regions of the ionosphere, in the
ity of the E region. See fig. 3.



ig. 3—Diagram illustrating the various layers comrising the earth's atmosphere. The tropospheric or eather layer is responsible for ducting, tropoheric bending and tropospheric scatter while the nosphere is responsible for the reflection of signals or skip. This diagram is not to scale.

uring periods of maximum sunspot activity, as
57 and 1958, worldwide DX on 6 meters was
stently possible on some circuits as a result of
ar F_2 layer reflection. Although the sunspot
ber is declining, some F_2 layer DX on 6 meters
be expected again this winter.

ring the past ten years major advances have
made in the field of long distance radio comcations. Among the foremost of these newly
oped radio techniques is ionospheric scatter.
hough a complete understanding of ionoic scatter at v.h.f. is still lacking, numerous
communications circuits in the range 30 to 75
e in operation. In general, these military cirare used for continuous communication to dis-
s of approximately 1300 miles by means of
directive antenna arrays, high power, and
ive receivers.

Ionospheric Irregularities

oral Propagation. During the severely dis-
l radio conditions, communication in the v.h.f.
is sometimes possible over distances conbly greater than the radio horizon by beaming
nals in a northerly direction.

estigation has shown that this phenomenon is
ated with the occurrance of aurora borealis
iern lights).

Auroral propagation has enabled amateurs hundreds of miles apart to communicate on frequencies which would normally not support such contact.

Generally, auroral displays are most common during Spring and Fall in the years immediately following a sunspot maximum. Peak auroral activity is therefore expected in the Spring and Fall of 1961.

To date, frequent instances of auroral propagation have been reported on two and six meters, with an occasional contact reported in the 220 mc band.

Since a flutter-fading component of from 100 to 2000 cycles is present on aurora reflected signals, a slow c.w. signal has a much better chance of success than voice.

Sporadic-*E*. When relatively small areas of high ionization density occur in the lower ionosphere they are capable of reflecting signals that are significantly higher in frequency than those which can be reflected by the normal ionosphere.

Generally speaking, sporadic E propagation is most common on frequencies below 30 mc, although during the summer months, when sporadic E is most common, some six meter activity has been reported, with frequencies as high as 144 mc occasionally propagated via sporadic E.

Sporadic E propagation is generally limited to about 1500 miles, although communication over greater distances, perhaps through combined sporadic E and F_2 layer reflection has on occasion been reported.

Meteors. Because of their extremely high velocity on entering the atmosphere, meteors produce a trail of highly ionized gases, approximately 60 to 70 miles above the earth.

When these trails are of sufficient length, or when the number of meteors entering the atmosphere is sufficient to produce ionized trails for an extended period of time, c.w. communication on two and six meters to distances of approximately 1500 miles is possible.

Since these signals are usually quite weak, high-gain antennas, sensitive receivers, and high power are required for communication by this means.

Tropospheric Wave

Propagation of v.h.f. and u.h.f. radio waves to distances well beyond the radio horizon is often possible as a result of certain variations in the weather. Unfortunately, the combination of variations in temperature, atmospheric pressure, vapor pressure, and precipitation are highly complex, and no hard and fast rules can be drawn about weather effects on v.h.f. and u.h.f. propagation. However, some generalizations can be made for use as guides in determining what effects weather may have on the propagation of radio waves above 30 megacycles.

Fronts. A weather front is a zone separating air masses of differing characteristics. Often, variations in the index of refraction in the atmosphere along a front will make possible v.h.f. DX contacts in a direction along this line. Thus, in the United States, in the fall, when cold polar air masses from Canada begin moving down in opposition to warm tropic air, optimum conditions exist for v.h.f./u.h.f. DX activity along the frontal pattern, to distances of many hundreds of miles.

Ducts. Normally, the temperature of the air decreases with increasing height above ground. Under certain conditions, temperature inversion occurs, in which the air aloft is warmer than that below. Where such an inversion is sufficiently rapid, or occurs in conjunction with a rapid decrease in humidity, propagation well beyond the radio horizon becomes possible.

Tropospheric Scatter. Considerable experimental evidence gathered over the last decade has shown that reliable communications systems can be established at frequencies as high as 5000 megacycles and higher, up to distances of about 750 miles, by utilizing a method of radio wave propagation known as tropospheric scatter. Although a great deal of work has been devoted to learning more about this method, no completely satisfactory theory explaining the propagation mechanism has been evolved. The most generally accepted theory holds that scatter is caused by irregularities in the index of refraction in the lower atmosphere.

As with ionospheric scatter, high power, large receiving antenna arrays, and highly sensitive receivers are mandatory in establishing effective communications circuits by this means.

Receiving Antenna Fundamentals

In order to collect electromagnetic (r.f.) energy radiated from a distant transmitting antenna, a receiving antenna must be able to extract energy from the electromagnetic wave as it passes. To do this efficiently the receiving antenna must, in effect, be coupled electrically to the medium surrounding it.

The electromagnetic wave, in passing, causes the free electrons on the antenna to move in the direction of the electric vector of the electromagnetic wave. A quantity having both magnitude and direction is called a vector. An electromagnetic wave consists of two components, an electric field and a magnetic field. These are perpendicular to each other and perpendicular also to the direction of motion of the wave. The electric and magnetic components of the wave are constantly changing magnitude and direction, as shown in fig. 4.

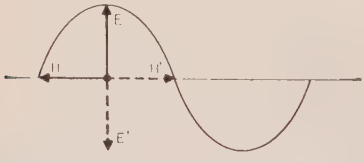


Fig. 4—Diagram of the mutually perpendicular E and H vectors. Variation of the E vector through one cycle appears as a dashed sine curve. Direction of wave travel is out of the page. H vector also varies sinusoidally.

If the electric vector is parallel to the axis of the antenna, the electrons will be induced to move along it, and a current flows in the antenna. Electron motion in the antenna continues even after the wave front has passed. The oscillations become damped (die out), their magnitude being dependent upon the resistance of the antenna.

The magnitude of the current induced in the tenna by the passing electromagnetic wave depe only in part on the strength of the passing r wave.

If we consider the antenna as a circuit elen which contains resistive and reactive compone then it becomes evident that maximum energy be delivered to the receiver when maximum rent is made to flow.

In a series circuit containing reactance and r tance, maximum current can be made to flow tuning the circuit to resonance. An antenna elen can be made resonant by cutting it to a length w will enable currents and voltages at specified points to be in phase and which will enable antenna to transfer maximum power to the rece The shortest length at which an antenna may considered resonant occurs when that length is half wavelength at a particular frequency.

Current distribution on a resonant half-wave tenna is such that it is minimum at the ends maximum at the center, whereas voltage, with same antenna, will be maximum at the ends minimum at the center, as shown in fig. 5.

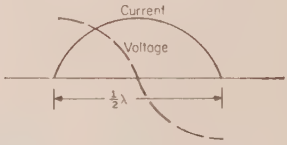


Fig. 5—Current and voltage distribution on a res nant half-wave antenna. Relative intensities of vo age or current are shown for any point along t antenna.

Since an antenna has a finite length, current voltages impressed on it by the passing el magnetic wave are in a state of continuous with a succession of these waves moving alon antenna, both toward its end, where they a flected, as well as away from it.

Actually, the currents and voltages on the an are the resultant of the waves moving in both tions. At certain fixed points on the antenn the waves flowing in both direction will alwa inforce each other. At other points, there is a a cancelling effect. Figure 6 shows the points either cancellation or reinforcement occurs. be seen from this figure that instantaneous of voltage and current vary sinusoidally. Beca the fixed maximum and minimum points, the are referred to as standing waves. Maximum are called loops, minimum points are called

The number of complete standing waves antenna at a given frequency is equal to the of the antenna divided by the length of a half length at that frequency. At lengths greate one-half wave which are an exact multiple of wave, the antenna will also be resonant. A lengths, an antenna is said to be harmo operated. Thus, an antenna exactly one wave long is operating on its second harmonic; at a of one and one-half wavelengths it operates third harmonic, etc.

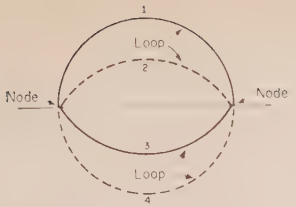


Fig. 6—Progressive picture of standing waves. Only the amplitude of the standing wave changes with time. Maximum and minimum points remain fixed at loops and nodes, respectively. Representation can apply either to voltage or current.

Antennas operated at lengths which are not an xact multiple of a half wavelength are said to be perated "off resonance." Under these conditions, e current induced in the antenna is out of phase ith the voltage at the feed points, and consequently aximum energy will not be delivered to the re-iver, even though the feed line and receiver are rfectly matched.

The electrical length of a half wave antenna in ee space is given by the expression $L = 492/f$, here L is in feet and f in megacycles. This is based the velocity of an electromagnetic wave in free ace.

In any other medium, however, this velocity is s than the free space velocity. This velocity de-nds primarily on the ratio of the length of the tenna to its diameter. For a thin antenna (ratio length to diameter of over 100), the modified pression $L = 468/f$ can be used in determining the tual physical length of a half wave antenna.

The electrons in the antenna which were set in otion by the passing electromagnetic wave serve a al function. We know that an electron in motion nstitutes an electric current. We also know that an ctron in motion gives rise to a magnetic field. ce electron motion varies, the magnetic field ated will also vary, and this in turn will give rise a varying electric field.

We can see, then, that the current induced on the enna by the passing radio wave not only delivers rgy to the load, but also, by virtue of electron tion in the antenna, creates a secondary electro-gnetic wave which re-radiates energy into space. Under conditions where the antenna is properly tched to the feed-line, the antenna will extract ce the power from the passing electromagnetic ve that it delivers to the receiver. The other half he intercepted power is re-radiated.

This re-radiated energy represents a power loss al to I^2R, where I is the current induced in the enna and R is a fictitious quantity known as the *iation resistance* and is equal to that value of stance necessary to dissipate the power lost by ation.

When measured at the center of a half-wave di-antenna in free space, the value of radiation stance is approximately 72 ohms.

Directivity Patterns

If we rotate our receiving antenna, first in the horizontal plane, then in the vertical plane, we find that the power received will vary, depending on the position in space of the receiving antenna with respect to a transmitting antenna that remains fixed.

If we plot received power as a function of position in space, first in the horizontal plane, and then in the vertical, we obtain a directivity pattern.

In order to compare characteristics of different antennas, it is desirable to make reference to a standard antenna. Here, the simple center-fed half-wave horizontal dipole antenna is used as a standard.

If we examine the directivity diagram of a dipole antenna, we find that the ability of the antenna to receive power will depend on the direction from which it is coming. It is maximum when the transmitting and receiving antennas are parallel to each other and perpendicular to the direction of travel of the wave. Such diagrams are shown in figs. 7(a) and (b) for the horizontal and vertical planes of radiation.

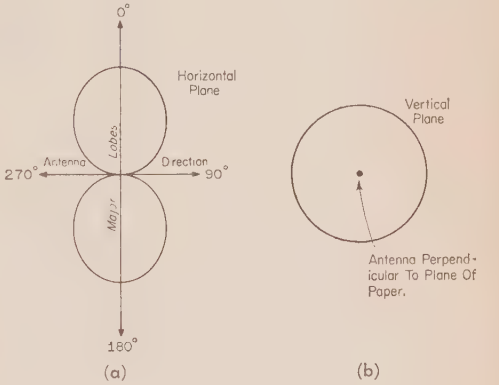


Fig. 7 (a)—Directivity pattern of a horizontal half-wave dipole antenna showing radiation in the horizontal direction. Fig. 7(b)—Directivity pattern of a horizontal half-wave dipole showing radiation in the vertical direction in a plane running perpendicular to the antenna axis.

Points on the diagram where received power is zero are called nulls. In the areas between nulls, where received power is maximum, the part of the diagram joining the nulls is known as the lobe.

Directivity diagrams can show either received power or induced voltage. This is so because received power is directly proportional to the square of the voltage.

In general, the term beam width is used to indicate directions in which the antenna is most receptive. Beam width is defined as that part of a lobe between which received power is 0.5 of the maximum or where the voltage is 0.707 of maximum.

Although the directivity pattern in space is three dimensional, the vertical and horizontal patterns can give a great deal of valuable information. They are obtained by taking the projection of the three dimensional pattern on planes running through and

[*Continued on page 121*]

A Wobbulator For Filter Alignment

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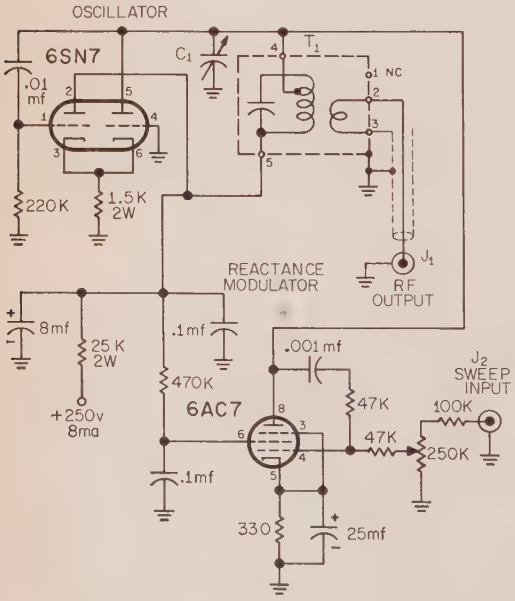
When a good, quick alignment of an if strip or filter is required, this gadget will be handy to have around. Whether you build it now or wait a few years is not important; eventually, it will be just what you need.

The origin of the term "wobbulator" is not known to the authors. By definition, it has come to be known as a sweep generator (the *rf* signal sweeps back and forth across a specific frequency) which is useful for alignment of communications receivers and crystal filters.

A wobbulator contains a sawtooth generator, a reactance modulator (or some other means of sweeping the *rf* oscillator), and a variable frequency oscillator. The latter is often band-switched and calibrated.

Along with the power supply this makes an expensive black box for the average hamshack. Many amateurs, realizing how difficult it is to align filters with nothing but a signal generator, often resort to purchasing commercially made filters.



Parts List

C_1—130 mmf variable
T_1—Transistor interstage transformer, 25K to 600 ohms, J. W. Miller #2041 or equivalent.

Fig. 1—Schematic diagram for the utility wobbulator. All resistors are ½ watt unless otherwise noted.

A Utility Wobbulator

The wobbulator about to be described is trul utility. It possesses nothing which is not essenti to proper operation, yet— and let this be plain— it sacrifices nothing. Its performance is even bit as good as the larger and more expensiv brother. In the first place it has no power suppli power is "borrowed" from the receiver or som other source. The B plus requirements will n break the back of even the smallest receiv power supply. The wobbulator has no time-ba generator but gets the required sawtooth wav form from the oscilloscope to which it is co nected. Since the standard *if* is around 455 k the wobbulator was constructed to sweep th frequency. If another *if* is used, it is a simp matter to change the oscillator coil to cover t proper frequency. It is for this reason that t two-terminal oscillator was chosen.

How It Works

The 6SN7 is a two-terminal oscillator and this unit utilizes a transistor *if* transformer the oscillator coil. The transistor *if* has a lo impedance winding which is normally connect to the base of the following stage. This windi

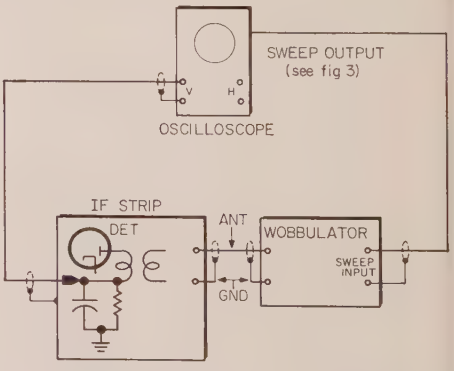


Fig. 2—Interconnections for the wobbulator. The output is taken from the receiver second detector load resistor. The dc signal voltage should develop across this resistor, and no coupling capacitor should be connected between it and the oscilloscope.

onveniently supplies a low impedance output rom the oscillator. However, almost any old *if* vill do, even one taken from a discarded broad- ast radio. The secondary winding should be ised as the output winding after removing the uning capacitor and about 90 percent of the otal turns. The *if* transformer specified, or its quivalent, does not require these alterations.

The 6AC7 is a reactance modulator. Saw- ooth output from the 'scope time-base is applied o the 6AC7 control grid via the gain control nd isolating resistor. Miniature tube equiva- ents may be used if desired without alteration o the circuit other than pin connections.

A *harmonic* of the oscillator may be fed to he receiver antenna terminals for alignment hrough the front end. After passing through he *if* strip and filter, the detected signal is fed o the 'scope vertical amplifier. This system does way with the need for synchronization pulses. As the time base moves the spot across the creen, the oscillator frequency moves across he *if* bandpass. At the same time the receiver iode output is fed to the vertical amplifier and he picture is displayed on the screen. By moving he receiver dial, or oscillator frequency, the pic- icture may be made to move across the scope race.

Construction

The physical layout of the components is not t all critical. Particular care must be used, how- ver, to see that hum does not enter the 6AC7 ontrol grid. If even a small amount of hum eaches the control grid the reactance circuit ill be modulated and the picture will contain pples and wiggles that are not really there.

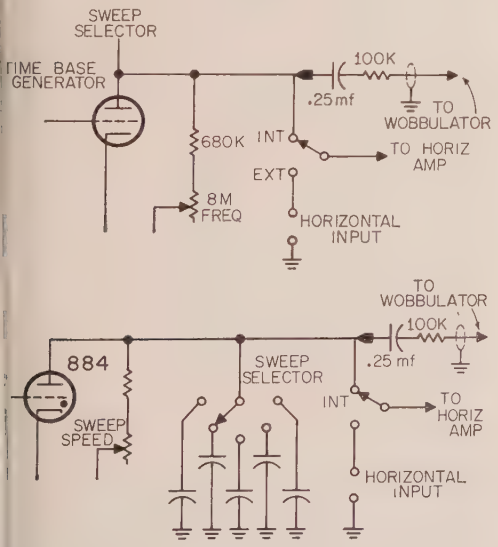


Fig. 3—Method of obtaining the sawtooth signal from the oscilloscope. It is impossible to describe all circuits, but generally speaking the .25 mfd capacitor and 100K resistor should connect to the point where the time base generator feeds the horizontal input selector switch.

In extreme cases the trace will be fuzzy and indistinct. For this reason it is important that the 25K, 2 watt resistor, and the 8 *mfd* electrolytic capacitor (decoupling components) remain in the circuit.

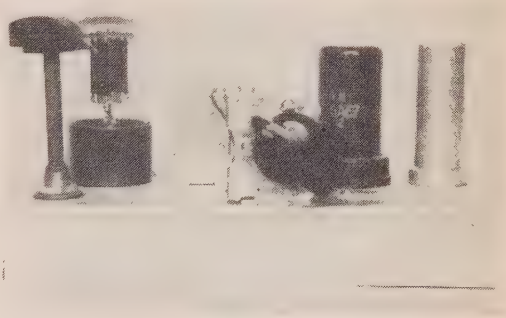
Operation

Use only shielded wire between the time base output and the reactance tube inlet point. In the original wobbulator, the shielded wire was soldered directly to the terminal strip under the chassis which avoided the necessity of using coax plugs and sockets. Use shielded wire from the receiver diode to the oscilloscope amplifier.

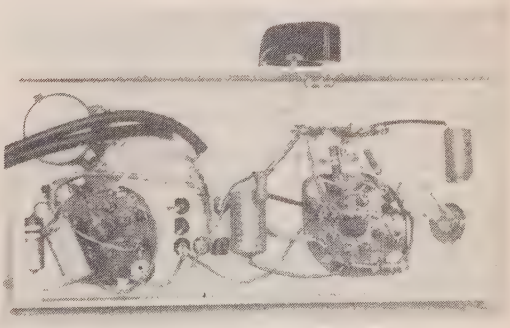
With the time-base turned off, and the oscillator tuned in on a receiver, note that the carrier is *absolutely* free of hum. There is no half-way on this. Use even more filter if necessary but make sure that the carrier is as pure as the driven snow! If the 'scope has no timebase output it may be easily modified as shown in fig. 3.

To align a 455 *kc if* strip, the receiver is tuned to the 160 or 80 meter band, and a harmonic of the oscillator is used. It doesn't matter what precise frequency the oscillator is set to, so long as it is not the *if* frequency itself. It is necessary to avoid having a signal coming into the receiver via two channels—one through the *if* and the other through the receiver front end. The har-

[*Continued on page 117*]



Front view of the utility wobbulator showing the location of major components. The if transformer T_1 is located between the tubes and the 8 mf capacitor is mounted to the right of the 6AC7.



Underside view of the utility wobbulator. Note that the shielded cables are soldered directly to the circuit to avoid connectors. As you can see sheet metal work is held to a minimum.

A Universal Antenna Coupler

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By ingeniously devising a method of variable link coupling to rotary inductors, W3EHE has come up with an antenna tuner capable of feeding balanced or unbalanced transmission lines from 50 ohms on up. Nothing has been spared in this installation and we offer this only as a source for further thought along these same lines.

THE greatest enjoyment that many people get out of amateur radio is in designing and building some contraption generally considered impracticable, if not even impossible, and then making it work.

My experience with antenna couplers dates back over the years to the cylindrical coil and pancake coil oscillation transformers of pre-World War I. They all worked after a fashion, on one or two frequencies, after the proper choice of words. It is almost impossible to avoid a little power flowing from antenna coupler, through the feeders, to the antenna, but a number of us have been very nearly successful in this respect.

I have always had a desire to own a coupler that will match anything from the proverbial bed spring to a pair of buried coax cables at any frequency from 29,700 *kc* to 1750 *kc*. This incidentally should all be accomplished from the front of the panel with no aid from screwdrivers, wrenches or bolt cutters.

The front-view photograph illustrates what has been accomplished for the last 4 years. It measures 19″ × 8¾″ with a 8¾″ × 13 × 17″ enclosure and, unless your time is worthless, it should not cost more than $1,000,000 to duplicate after setting up a complete machine shop.

During my years of struggle with this problem I've had but one fairly good multi-range antenna coupler, easily recognized from fig. 1, as the Collins twin-pi coupler, vintage 1933 or so[1]. Many amateurs used it on 160-80-40 and, in some cases, 20 meters. When properly adjusted, the clips to the plate ta coil could be attached or removed and the plate c rent dip was found at the same spot on the tuni dial. There were no roller coils around at that ti so the circuit was not as finely adjustable as o would like. At the higher frequencies it was diffic to clip to the tank coil at the proper fraction o turn. This tuner could not readily be located motely from the transmitter, although some versi with link coupling were used.

A balanced line is generally considered the id means of center feeding any antenna, especi multi-frequency jobs. However, there are m forms of single wire and single coax feeds in u and these too, must be accommodated.

[1]Collins, A. A., "A Universal Antenna Coupling System for Modern Transmitters", *QST*, Feb. 1934.

Desirable Coupler Features

The old Collins twin-pi network only need some modernizing to couple a variety of feeders a antennas to modern, single-ended, pi-network fi as well as to the center of push-pull final tanks. T following features are desirable and/or required

1. Coax line from final amplifier to the ante coupler.
2. Provision for r.f. bridge or Micro-match line to the coupler, with low-pass filter in ser
3. Variable coupling from transmitter to "cold end" of the coupler coils.
4. Reactance cancellation in the ground leg the coax line to the coupler.
5. Ganged roller coils in the coupler.
6. R.f. ammeters in feeders.
7. Antenna selector switch.

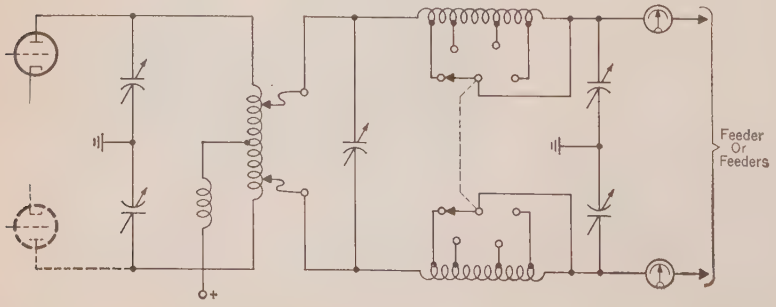


Fig. 1—Original circuit o the Collins Twin-Pi Coup ler.

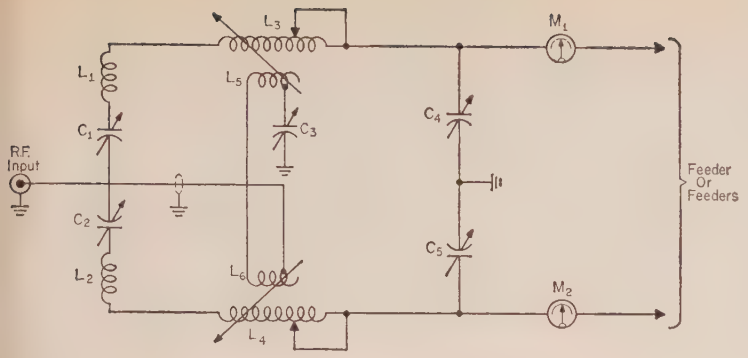


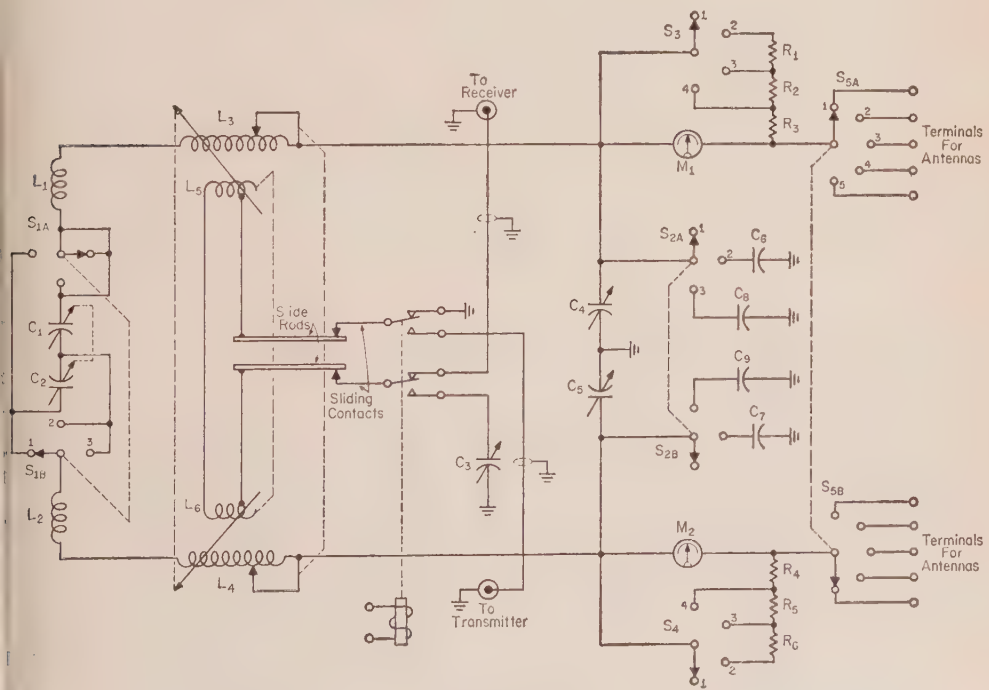
Fig. 2—Basic circuit of the Collins Twin-Pi Coupler illustrating the method used at W3EHE to link couple to the rotary inductors. Inductors L_1 and L_2 are used on ten meters.

8. R.f. probe points for 'scopes, modulation and carrier-shift indicators, etc.
9. Send-receive relay.
0. Complete front panel control.

Variable Inductors

Most of these features were not too difficult to vide. One, however, was a puzzler; that was, how gang the variable inductors and how to provide variable coupling to them. Study of the ganging problem indicated the advisability of using gears. Variable inductive coupling was a problem because of the roller and contact rod being in the way. The photograph from the top of the unit gives some clues as to the solution, and an attempt will be made to clarify the rest of the procedure.

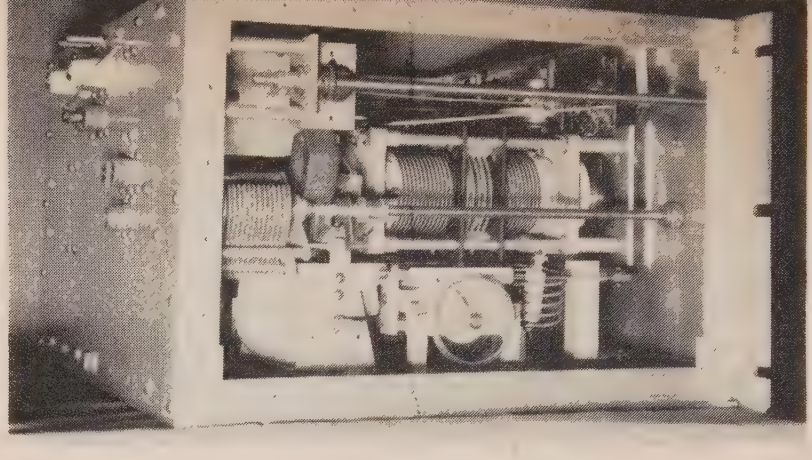
Figure 2 is the basic schematic diagram of the coupler and fig. 3 is the circuit as constructed.



C_2—100 mmf variable, transmitting type spaced .093".
50 to 500 mmf variable, see text.
5—500 mmf variable transmitting type spaced .045".
7—400 mmf surplus transmitting mica 3000 w.v. matched, see text.
9—900 mmf surplus transmitting mica 3000 w.v. matched, see text.

L_1, L_2—5 Turns #12, 1½" dia. × 1½" long.
L_3, L_4—24 μh—rotary inductor from BC-375 or equivalent (E. F. Johnson 229-203).
L_5, L_6—5 Turns each of #12 soft drawn copper, wire spaced, $2\frac{7}{16}$" diameter, see text and fig. 4.
M_1 M_2—R.f. ammeter 0— 0.5 amperes.
R_1, R_2, R_3, R_4, R_5, R_6—Meter Shunts, see text.

Fig. 3—Actual wiring diagram of the Universal antenna tuner showing input and output capacitor switching. Care should be taken to insure that the meter shunts are carefully matched.



Side view illustrating the method of mounting the rotary inductors and the associated gearing arrangement. The link can be seen mounted on the rotary inductor spacing bars. The ten meter inductor and input tank capacitor C_1 are mounted below the rotary inductor. The long shaft coupled to the right angle gearing arrangement at the upper left is the antenna selector switch. Mounted below the right angle drive is the link loading capacitor C_3 and below is C_4, one of the output tank capacitors. Balanced and unbalanced output connectors are mounted on the rear panel.

The roller coils used were from the BC-375 transmitter and are about 24 microhenries each. They were geared together on the ground side of the insulated flexible coupling, with three 2½" p.d., 32 pitch gears. The two outside gears are brass, Boston Cat. G111 with 1/16" face. The middle gear is steel, Cat. 53280 with 3/16" face. The counter dials are removed from both roller-coil units and one is installed on the center-gear shaft. Figure 4 indicates the method of making a common drive unit out of the two coils. It will be noted that outboard bearings are provided for the shafts of the two outside gears. The inboard bearing is at the roller coil itself. The center-gear shaft is fastened to the turns-co ter dial mechanism which has a good bearin adequate cantilever strength. Any other good r coils of similar inductance may be used. If it i desired to tune the 160 meter band, an induct value of about 15 microhenries should be sui At this point it is well to note that no "dead s were found with a grid dip meter in any o amateur bands covered. Using the output of a with 500 watts input, no parts of these roller have shown any warmth to the touch. Prior t final arrangement, these same coils had been on a full 1 kw unit and had been satisfactory.

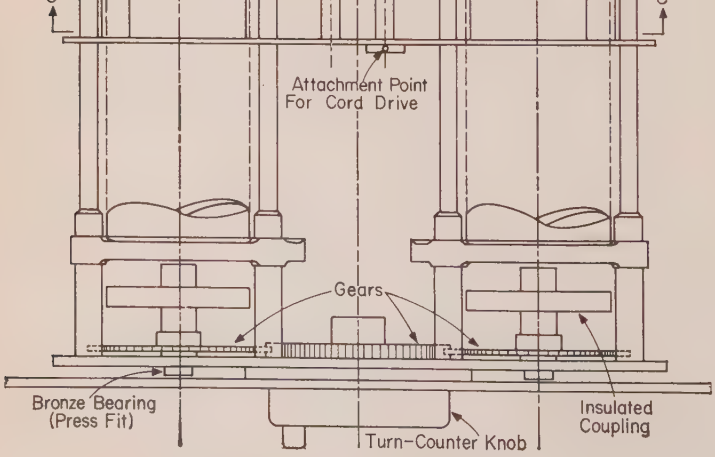


Fig. 4—Diagrammatic view o the two BC-375 rotary induc tors as seen from the top. Thi view illustrates how the link L_5 and L_6 are fixed to a move able train which rides on th original rails of the rotar inductor. Wiper contacts ric ing on slide bars insure positive contact at all time The whole variable train pulled back and forth ove the rotary inductors by mean of a pully arrangement. Th front panel control is locate between the r.f. ammeters

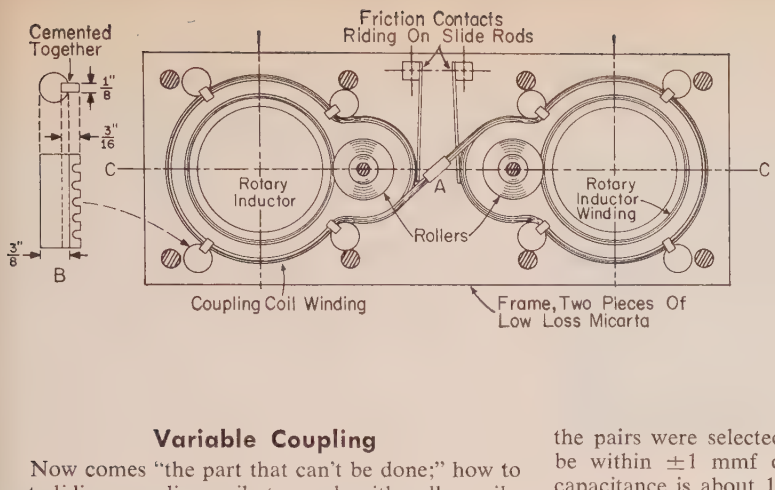


Fig. 5—This view illustrates how L_5 and L_6 are wound to allow passage over the roller contact of the rotary inductor. Both coils are joined at point A and the other ends of the inductors are fixed to the wiper contacts which ride on the slide rods. Detail B illustrates the method of mounting the five turn links on the polystyrene spacers.

Variable Coupling

Now comes "the part that can't be done;" how to get sliding coupling coils to work with roller coils. There's nothing to it! The end of the two roller coils with the coupling coils attached looks like fig. 5. The coupling coils are simply deformed to clear the roller and are perfectly normal in other respects.

The coupling coils were made on a winding form, of the same shape that they are, out of #12 bright, tinned, soft copper wire. They should be wound so that they are same relative polarity as the coils they couple to. To help in getting this correct, visualize them as though they were wound as a continuous length in the same direction, and over the two roller coils placed end to end. Then move the two roller coils to a parallel position with half of the coupling coil winding surrounding each. The two halves of the coupling coil are still connected by the "bent turn" (detail A, fig. 5) and are phased correctly.

In obtaining variable coupling to the roller coils, the roller coil tie rods are used as mechanical slides for the insulated supporting frame of the coupling coils. Metal slide rods are used to connect to the coupling coils. The top view photograph shows the cord drive method of moving the coupling coils. The control wheel is calibrated to indicate degree of coupling. The number of turns of the coupling coil can be adjusted only by getting inside the box, but it has never been necessary to change the number in use (2 per coil) for operation from 10 through 160 meters. External means of making such a change would be next to impossible. Fortunately, the degree of coupling variation available is more than adequate to make up for fixed coupling coil turns.

The roller coils are 2" in diameter and are on 5" centers, thus providing a separation of 1½ coil diameters. Mutual coupling between them has not been a source of trouble.

Input and Output Tuning

The input and output variable capacitors are controlled from concentric dials with common knob (in and out) control. Actually, this refinement is not as convenient as the independent dials used on the bread board model.

The output padding capacitors are employed in 400 and 500 mmf steps and are 3000 w.v. (surplus) transmitting micas. They are switched in pairs, and the pairs were selected by a capacitance bridge to be within ±1 mmf of each other. Total output capacitance is about 1400/1400 mmf.

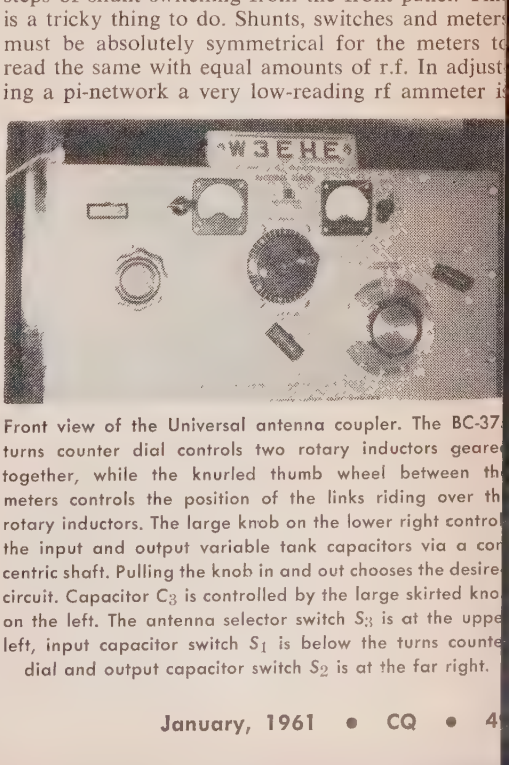
The input variable capacitor (C_1C_2) consists of two 100 mmf units, ganged. It is switched to use 2 sections in series (50 mmf), 1 section (100 mmf) or 2 sections in parallel (200 mmf). These capacitors are well clear of, and insulated from, the chassis and controls. Plate spacing is .093".

The output variable capacitors, (C_4C_5) are 500 mmf each, .045" plate spacing and coupled together mechanically.

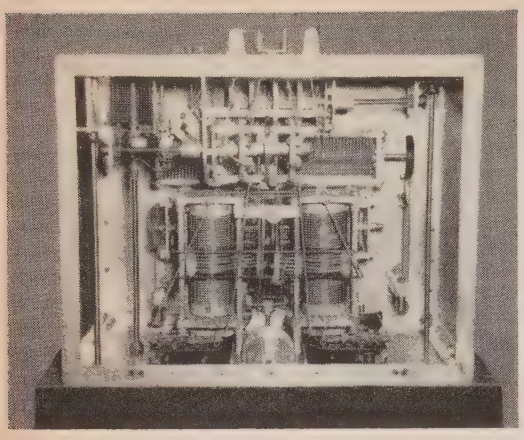
The 10 meter coils may be seen in the end-view photograph. A fortunate choice of diameter, turns and spacing permits the use of 1 turn or so of roller coil in the circuit on the 10 meter band. This is adequate to couple to the transmitter at this frequency.

R.F. Ammeters

The r.f. ammeters are 0 to 0.5 amps and have 3 steps of shunt switching from the front panel. This is a tricky thing to do. Shunts, switches and meters must be absolutely symmetrical for the meters to read the same with equal amounts of r.f. In adjusting a pi-network a very low-reading rf ammeter is



Front view of the Universal antenna coupler. The BC-37 turns counter dial controls two rotary inductors geared together, while the knurled thumb wheel between the meters controls the position of the links riding over the rotary inductors. The large knob on the lower right controls the input and output variable tank capacitors via a concentric shaft. Pulling the knob in and out chooses the desired circuit. Capacitor C_3 is controlled by the large skirted knob on the left. The antenna selector switch S_3 is at the upper left, input capacitor switch S_1 is below the turns counter dial and output capacitor switch S_2 is at the far right.



Cover Photo

Top view of the antenna tuner showing component layout and shaft placement. The large hub at the bottom, controls the sliding rack which couples L_5 and L_6 to the rotary inductors. The large ceramic rotary switch at the top selects the antennas and the wafer switch at the rear selects the output capacitors. The pulley and cords mechanism attaches to the large skirted knob on the front panel and by a push or a pull, either input or output capacitor may be selected. The relay and mica capacitors can be seen nestled under the large switch at the rear.

a help when starting to match. When the first output indication is reached, further adjustment requires a higher-range ammeter. By means of the shunts, these meters cover 0 to about 5 amps, in overlapping ranges. Silicon or germanium rectifier-type output indicators might be used instead of r.f. ammeters, and being basically linear in scale, instead of current-squared, might require less range-adjustment. This can be a troublesome output device when coupling to feeders in the presence of standing waves. It should be remembered that whenever a 500 to 1000 watt transmitter is matched to a variety of loads from 50 ohms to several thousand ohms a very wide-range output-indicating device is required.

Adjustment

Initial adjustments of such a device should be made at the lowest power input possible. A grid-dipper is helpful in the first rough settings. Calibration cards should be made of final settings at several places in each band. To return to the best match of transmitter-to coupler-to feeders is then a very simple matter.

The 350 mmf variable capacitor in the coax lead from the final amplifier is very useful in arriving at a low standing wave ratio at this point. A v.s.w.r. device, such as a Jones Micro-match, left continuously in the circuit, is strongly recommended. Life is probably much simpler without it, but its use encourages the efficient use of tubes and components in the final amplifier and it gives the low pass filter a better chance to perform its function. If a low pass filter is used (and it should be) it should be connected in the coax line from the transmitter after the v.s.w.r. device.

This tuner has been used very satisfactorily to feed:

a. 52 ohm dummy antenna, with one end grounded.
b. 52, 104, 200, 300, and 600 ohm dummy antennas with balanced feed to both ends.
c. A full sized 20 Meter beam with Tee-match, fed by buried, parallel RG-8/U, 52 ohm cables. (104 ohm feed).
d. A full size Hy-Gain 10-15-20 Meter beam with buried RG-8/U cable to the Gamma match.
e. A 120 ft. flat-top, single wire, center fed with 2" spaced feeders about 75 feet long. All bands 10 to 160 meters.
f. The same antenna, with the feeders tied together and used on 160 meters.

When used with a single wire line, the other feeder position can be grounded or not, as the operator sees fit. My experience is that it works best without the ground. When the unused position is grounded, there is current in the unused r.f. ammeter. This is annoying, and probably isn't doing any good.

There are a few miscellaneous points that are worth mentioning. This matching device is just as good for receiving as it is for transmitting, so a d.p.d.t. relay is mounted in the cabinet to transfer the coupling coil leads. The 350 mmf variable capacitor, in series with the coax from the transmitter, is used only when transmitting. About 500 mmf would probably be a better value, if there is room for it.

The antenna selector switch selects any of several coax fittings and one pair of porcelain feed-through insulators.

The coupling coils are adjusted to be close to the "cold-end" of the roller coils as indicated by the location of the roller contact. This is not difficult as calibration of the turn counter and coupling control were made so that they coincide. If coupling coils are moved beyond the roller contact, towards the "cold end," most of the coupling is then to the shorted turns on the roller coils.

There are several places where an r.f. probe may be inserted. One is to the "hot side" of the coupling coils. Others are at the r.f. ammeters ahead of the antenna selector switch.

The components and their arrangement provides the antenna tuner I have always thought of as ideal. I realize that no true amateur ever copies anything and it is therefore strongly suggested that any attempt to re-produce one of these units be nursed carefully through the breadboard stage. When possible, try mounting grounded, non-magnetic, metal sheets in similar positions to the components that the parts of the cabinet will be. In this way it will be possible to eliminate any undesirable effects before final assembly. ■

REPRODUCING YOUR CLUB BULLETINS

E. H. Marriner, W6BLZ
528 Colima Street
La Jolla, California

Print your own club notices using the Hektograph method of printing. It's simple! First, to keep the cost down, buy the material rather than purchase the ready made kit. Most office supply stores carry all the necessary supplies, except the tray; this can be a biscuit tray or aluminum dish from a frozen food package.

Gelatin

To start with, let me say that the gelatin has to set for twenty-four hours in order to harden sufficiently. Remove the lid from the can of gelatin and place the can on the stove in a pan of water. Heat slowly until the gelatin is in a liquid form enough to pour into the tray; then cover the tray so that lint and dust doesn't settle on the surface and wait for twenty-four hours. In the meantime you can type your club notices.

Take a master sheet—notice it consists of a blue carbon and a white sheet with a thin tissue in between for protection during shipping. Tear out the middle sheet and put the master copy in the typewriter so that you can type on the blue surface. When typed, there will be blue lettering on the white master copy.

Printing

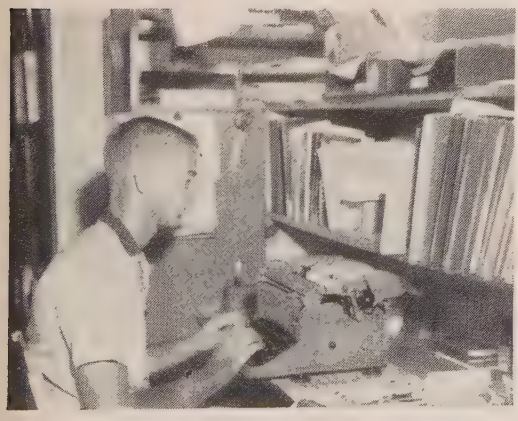
When you are ready to print, first dampen the surface of the gelatin very lightly with a moistened sponge, being careful not to let water run down the sides. Next put the white master copy on the surface with the blue printing face down on the gelatin and smooth with your hand or light roller. Peal this master off and you will now see the printing is on the gelatin—you are now ready to print.

Take your post cards, or paper, and lay it on the surface of the gelatin; smooth and peal off. You should have a nice clean reproduction. This process can be carried out from sixty to three hundred times for reprints.

As soon as you are through printing, take the gelatin and hold under the water faucet and use water no warmer than necessary to wipe off the ink. The surface of the gelatin becomes slimy and the ink wipes right off. After it has hardened again you can repeat the process of printing. It's fun—give it a try. ■

Materials

Carter's Master Unit Sheets—6¢ each
Hektograph composition #280 gelatin, manufactured by the Heyer Corporation, Chicago, or equivalent
Trays—Home made, or cake tins



Type club news on to the blue side of the master sheet, after tearing out the tin tissue separating the carbon from the white sheet. This will leave blue typing on the white sheet.

After warming gelatin in a pan of warm water, pour slowly into a pan and let it set 24 hours. A square tray is best for centering the paper in one corner, producing even printing.

About Receivers:
General Coverage Versus Ham Bands

Marvin Tepper, W1YCV
81 Wollcot Street
Malden, Mass.

The author mulls over the pros and cons of general coverage and ham-band-only receivers.

It would be a safe bet to say that at one time or another every ham has either thought of or discussed the differences between a restricted coverage (ham bands only) receiver versus a general coverage receiver.

Frequency Coverage

By general coverage receiver we mean one covering 540 *kc* through 31 *mc*, or 1.8 *mc* through 54 *mc*, continuously, with slight overlap for band changes. Typical band coverage is listed below:

Band A .500 — 1.6 *mc* = 1.050 *mc* bandwidth
Band B 1.6 — 4.9 *mc* = 3.3 *mc* bandwidth
Band C 4.6 — 13 *mc* = 8.4 *mc* bandwidth
Band D 12 — 34 *mc* = 22 *mc* bandwidth

By a restricted coverage receiver we mean one covering the popular ham bands. It might have such typical bands and bandwidths as listed below:

Band A 3.5 — 4.0 *mc* = 500 *kc* bandwidth
Band B 7.0 — 7.3 *mc* = 300 *kc* bandwidth
Band C 14.0 — 14.4 *mc* = 400 *kc* bandwidth
Band D 21.0 — 21.5 *mc* = 500 *kc* bandwidth
Band E 28.0 — 29.7 *mc* = 1.7 *mc* bandwidth

Note the extremely limited bandwidth coverage of the ham bands as compared to the extensive bandwidths required of a general coverage receiver.

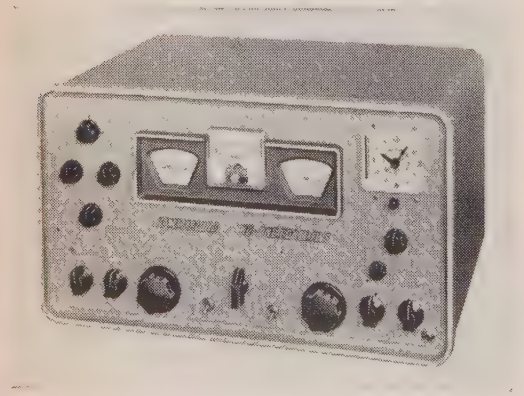
Costs

Prior to a discussion of the electrical and mechanical differences it should be pointed out that one of the major differences does not concern either electrical or mechanical problems at all. It is a difference in costs. This often overlooked but vital fact is one of the major reasons for the sharp increase in the number of restricted coverage receivers available. Restricted coverage receivers require less and/or smaller components plus less complicated construction features (dial scales for instance) permitting more receiver per dollar.

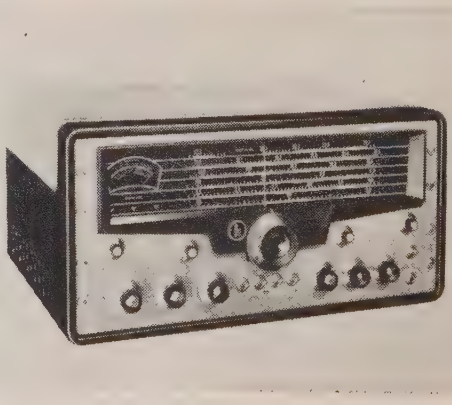
Dials

Differences between general and restricted coverage receivers are readily apparent; however they are not so simple as to lend themselves to a mere listing under two columns headed Pro and Con.

To continue with the previously mentioned thought of dial scales, a restricted coverage receiver requires fewer scales and less frequency coverage on the dial, permitting expanded dial scales. This, in turn permits better resetability of the dial pointer. Special receivers that use one dial with separate scales for general coverage and ham



A Hammarlund general coverage receiver incorporating a separate dial for general coverage and one for bandspread.



A Hallicrafters restricted coverage receiver. Note the single dial, one knob tuning and wide spacing of the dial frequency markings.

bands have been in use for some time, an example is the NC 240D. Turning the band change knob from a general coverage band to a ham band moves the contact fingers to a tap on the coil winding. Tapping a portion of the general coverage coil provides bandspread coverage for the ham band. This requires multiple positions of the band change mechanism, an increased number of dial scales, and most important, increased cost.

Tuning

In a restricted coverage receiver only one tuning capacitor is required. Being essentially a bandspread capacitor, it permits double-spacing of the plates and rugged construction for increased stability.

Although there are exceptions, the majority of general coverage receivers require adjustment of the general coverage tuning capacitor, then the bandspread capacitor. In a restricted coverage receiver it is always "one knob" tuning. The exceptions in general coverage receivers using single knob tuning are those using expensive mechanical drives with slow (bandspread) tuning and fast tuning ratios. In addition there are "one-knob" general coverage receivers such as the National HRO, using plug-in coils for either general coverage or special plug-in coils for band-spread. A general coverage receiver using a separate bandspread capacitor permits tuning similar to that of a restricted coverage receiver.

General coverage receivers often use a line or a dot on the dial scale for setting the pointer on the main tuning dial. The accuracy of this position of the main tuning capacitor will determine the resetability of the bandspread dial pointer.

Frequency Coverage

One of the more serious limitations of a restricted coverage receiver is indicated by its title, restricted coverage. Reception of MARS, CD, WWV, and other frequencies out of the ham bands is accomplished only by special circuits, converters, etc. For the amateur who likes to listen to foreign broadcasts, monitor satellites, copy commercial or military transmissions, a general coverage receiver is mandatory. In addition, testing for spurious emissions, harmonics, etc., that fall outside the ham bands requires the extensive coverage of an all-band receiver.

Local Oscillator

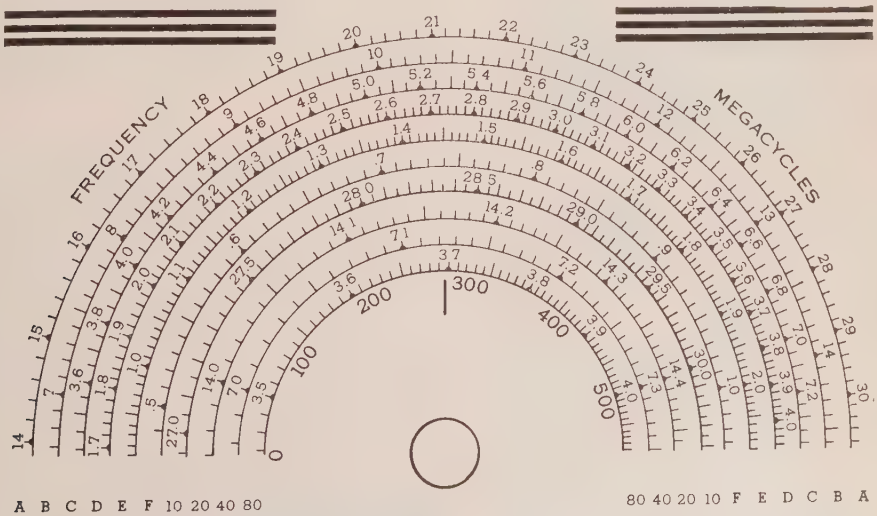
The local oscillator in a restricted coverage receiver can be readily made to more closely track the incoming signal over the narrower range of frequencies being tuned. With the oscillator exactly on frequency to provide the precise value of intermediate frequency at the output of the mixer, the highest gain will be achieved in the i.f. circuits.

In addition the restricted oscillator range allows a higher C to L ratio. The increased capacitive value of the circuit allows swamping out the usually annoying tube and stray capacity changes, providing improved oscillator stability.

Summary

In summarizing, where "hamming" is the main activity the restricted coverage receiver provides the most desirable features for the least expenditure of money. Where such activities as construction of amateur radio equipment, amateur radio experiments, listening to foreign broadcasts etc., is in demand, the general coverage receiver provides the most desirable features.

The best answer of course is that of good old George G. Gotbucks W13GGG (he has his own zone and initial call letters naturally), who took this month's spare stock dividend income and purchased both a general coverage and ham band only receiver. ■



Dial scales of the National NC-240D combining general coverage and amateur band scales on one dial by the use of a 10 position bandswitch.

Improving Power Supply Techniques

Bruce B. Lent, K6HRU
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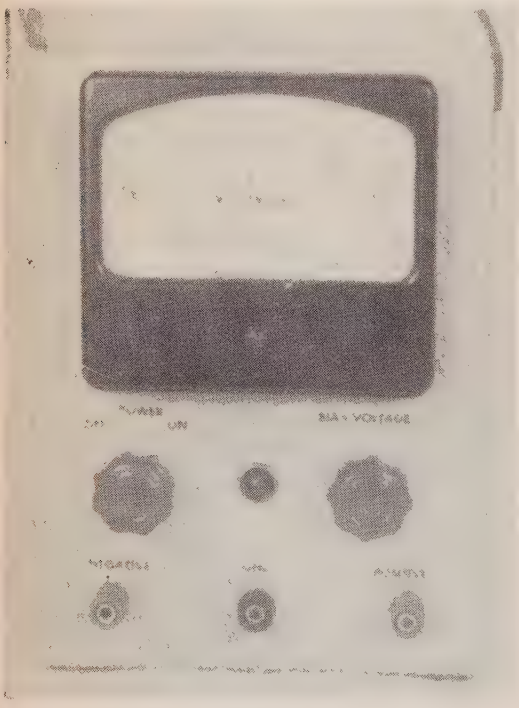
Alhambra, California

A variable "Electronic Load" that can be used to test power supply regulation and ripple as well as individual power supply components.

As most readers have probably noticed, there is a definite need for improvement in the average ham's power supply. In many pieces of equipment the power supply is a secondary item. It is usually composed of various items of junk which have been stored under the cobwebs.

The use of junk box parts is a good idea so long as it is not misused. Repeatedly, open filter capacitors are inserted in the circuit. Another even more common error is the disregard of the values of filter capacitors. Too often rectifiers won't handle a large enough amount of current. Transformers sometimes only supply about half the desired voltage.



Front panel of the adjustable load. Varying the bias voltage control varies the current drained by the parallel 6BG6s. The load current is measured by the milliameter. Direct connection to the meter can be made through the terminals marked — +.

The above problems end up as equipment problems because of improper tests. Usually these improper tests are a result of the lack of test equipment. The absence of test equipment is often due to the idea that such equipment is expensive. To equip a shop with top quality test equipment is expensive, but for most ham needs, top quality equipment isn't necessary.

The most important piece of equipment is a voltmeter. For most power supply applications a 1000 ohms per volt movement is adequate. These may be purchased for as little as $5.00 and frequently less.

A second, and very important piece of equipment is a variable electronic load. This, when used in conjunction with a voltmeter, can be a very valuable instrument.

With the above instruments, one may rate power supply components before installing them. With these instruments and some clip leads, simple and inexpensive test setups may be devised.

Filter Capacitors

With the combination of these instruments, the proper size of filter capacitors may be chosen. A common misconception is that the larger the capacitor value the better it will operate. This is true, as far as filtering goes, but if the filter capacitors are too large they may cause damage to the rectifier. By choosing a ripple percentage, and making your selection around this figure, the proper capacity value may be selected. This will be further discussed under "applications".

Transformers

Too often transformers are rated with only a voltmeter. Just a voltage reading is inadquate. A loading device is necessary. As a transformer is loaded the output voltage drops.

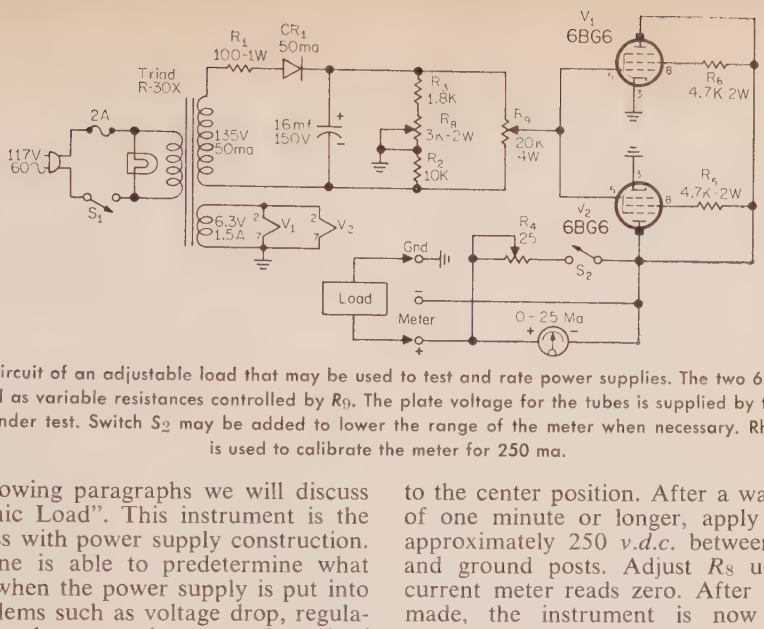


Fig. 1—Circuit of an adjustable load that may be used to test and rate power supplies. The two 6BG6's are employed as variable resistances controlled by R_9. The plate voltage for the tubes is supplied by the power supply under test. Switch S_2 may be added to lower the range of the meter when necessary. Rheostat R_4 is used to calibrate the meter for 250 ma.

In the following paragraphs we will discuss the "Electronic Load". This instrument is the key to success with power supply construction. With this, one is able to predetermine what will happen when the power supply is put into service. Problems such as voltage drop, regulation, ripple, and many others may be solved beforehand.

Circuit Description

The variable electronic load's operation is very basic. The plate voltage for the tubes that act as the load is provided by the power supply under test. A low voltage bias supply is located inside the instrument. This power supply is designed to provide either a negative or positive voltage to the grids of the load tubes.

The 6BG6's act as the load. The grids act as a means to control the amount of current drain. With the grid bias supply being so designed to supply either a negative or positive voltage, the tubes may be driven into full conduction or into cutoff. The more positive the grid voltage, the more current drained. The more negative the grid, the less current drained. In this circuit the bias control which is placed on the front panel, is used to control the amount of load current.

Zero Adjustment

The pot, R_8 is the zero adjustment control and is used as a means of zeroing the 6BG6 plate current. In essence, this control is employed as a means of changing the cutoff point of the load tubes. Experiments have disclosed the following reasons for making R_8 variable: First, all tubes (even if they are the same type) vary in some way or the other. In this case it is necessary to compensate for the tolerances in the grid circuit of the 6BG6s. The second reason for using a variable control for R_8 is to make adjustments as the tubes age. As the 6BG6s become older, the characteristics change making it necessary to rezero the plate current.

To zero the variable electronic load proceed as follows: Turn on the power. Make sure R_9 is turned completely to the left and R_8 is set to the center position. After a warm up period of one minute or longer, apply a voltage of approximately 250 *v.d.c.* between the positive and ground posts. Adjust R_8 until the plate current meter reads zero. After this setting is made, the instrument is now suitable for most normal operations. In cases where voltages applied to the instrument exceed 625 *v.d.c.* the operator may find that the instrument won't zero. This is normal and occurs because of the limited voltage range of the bias supply.

Maximum Ratings

When operating the instrument, precautions should be taken when applying a voltage across the load tubes. For prolonged periods of operation such as tests which may last one minute or more, a maximum voltage of 550 *vdc* may be applied. When conducting tests with voltages over 550 *vdc*, the test period should last for less than one minute. Under no conditions should a voltage over 700 *v.d.c.* be applied across the 6BG6s.

The operator should also observe load current when the instrument is in operation.

The maximum amount of continuous current should be 220 *ma* but 270 *ma* is tolerable for intermittent operation. Extreme care should be taken not to damage the meter.

In the schematic, (fig. 1) there are posts marked negative and positive and ground. The ground and positive posts are used when the instrument is being used as a load. The negative and positive posts are used when the instrument is being used as a milliammeter. The positive post is the positive side of the meter. The negative post is the negative side of the meter.

Construction Hints

The variable electronic load, in fig. #1 is built in a 8 × 6 × 4½ (LMB #146 or equiv.) interlocking box. This particular box comes with a factory paint job. This will save the builder the annoyance of a possible poor paint job.

Holes are punched in the rear for ventilation and the *ac* line cord. There should be ventilation

holes at both top and bottom. This will provide a steady flow of air. Due to the compactness of the instrument, it is a good idea to make as many holes as possible. Placing a blower at the top would provide a steadier flow of air. This would reduce the amount of drift due to heating. If a blower is used, it should be located at the top, blowing outward. An outward blowing fan will provide a more uniform cooling than one blowing directly on the tubes.

Budget

Many of the readers are probably interested in various ways to decrease the cost of the instrument. Here are a few suggestions. These suggestions haven't been tested but, I can't see why they can't work. If the reader wishes, he may try them.

The first suggestion is the substitution of 1625s for the 6BG6s. This would reduce the cost greatly, but would introduce the problem of a 12 volt filament supply.

Another way in which the cost may be reduced is by using an external milliameter, such as one in a multimeter.

Applications

Because of their high current ratings, it is very popular for one to build a power supply using a television power transformer. Repeatedly this results in failure because the transformer won't supply enough voltage when loaded. Too often this is found after it has been placed in operation.

In order to avoid such a disappointment, a set up such as in fig. 2 may be used. The transformer under test is connected, by way of clip leads, to the rectifier plates, in this case a 5U4. The positive side of the load is connected to the filament of the 5U4 and the ground side of the load is connected to the center tap of the transformer. The load is set until the meter reads the same amount of current that will be consumed by the equipment to be operated. After the setting is made, the actual voltage that will be present for use may be read from the voltmeter. In this way, one is able to determine what the voltage output will be.

Regulation Percentage

Often times it is necessary to know the supply regulation characteristics. This may be accomplished by first taking a voltage reading with no load again using the circuit shown in fig. 2. Second take a voltage reading with the desired amount of load current. Now these values may be submitted in the equation:

$$\% \text{ regulation} = \frac{E \text{ no load} - E \text{ full load}}{E \text{ full load}} \times 100$$

The percent of voltage regulation should be of the lowest value for oscillator circuits. In amplifier circuits, the regulation may be of a higher value.

Ripple Percentage

When a power supply is to be used for a modulator of phone transmitter, the ripple voltage should be kept very low. In a c.w. transmitter the ripple should be kept to a minimum, but this isn't as important as in a phone transmitter.

As more current is drawn from the power supply, the greater the ripple voltage present. Since this is the case, a loading device should again be used.

A setup similar to that used to determine regulation in fig. 2 may be used but the desired filter network is included. A voltmeter and load are connected across the power supply output. The load is set to the desired amount of current. Now the the voltmeter is set on the *a.c.* voltage range. The amount of ripple voltage is equal to the *a.c.* voltage reading.

It is actually the percentage of ripple that is more important than the ripple voltage. In c.w. transmitters a ripple percentage of about 5% is in the safe range, where in a phone transmitter the ripple should be kept below 3% in the final and modulator tubes. The audio preamp should be kept as low as possible.

To determine the percent of ripple set the load so the meter reads the desired amount of current. Now read and record the *d.c.* voltage output. Second, read and record the *a.c.* voltage present. After doing this substitute these values in the equation:

$$\% E_r = \frac{E_{ac}}{E_{dc}} \times 100$$

This instrument may also be used for testing voltage regulator quality, batteries and unknown current ratings of chokes. ■

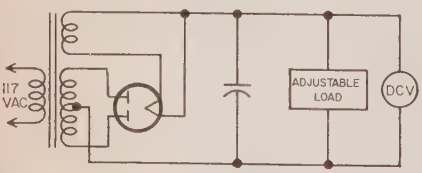


Fig. 2—Simple test set-up used to test the transformer and/or the rectifier ratings.

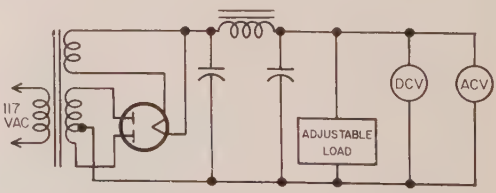


Fig. 3—Simple test set-up for checking ripple percentage.

CQ Contest

Irv Strauber, K2HEA
12 Elm St.
Lynbrook, New York

1255—A quick check to make sure that everything is in order: log, pencils, aspirin, "No-Doze"—yep, ready to go! Strategy—open up on 15 until 1600—switch to 20 until 1800—back to 15 until the bands fades—then back to 20 until 0700—up to 10 meters if it's open then back to 20 or 15 until closing time! Or—should I spend more time on 20? or 15? Propagation reports—that's the answer! Where the —— are the reports? Lemmee see . . hmmm . . a QSL card from VU2ZX . . should really send him a card in return . . . light bill for last month . . who the heck burns so much around here? Must remember to speak to the XYL about that! Doc's bill for treating mashed fingers when the tower slipped . . . must remember to pay good ole Doc. . . . ah, here they are . . let's see . . for goodness sake . . last month's charts! Oh well, we'll play it by ear! Oops, 1302—missed the first two minutes!

1302 + 30 seconds—Now what's wrong? Can't hear a blessed thing in the headset . . (what the—— did you do to the rig? . . . . what was that? Wait till I get the cans off my ears. Try plugging the phones in? What do you think I am? Stupid? Sure I plugged them in! What was that? So I'm stupid but the receiver is deader than—try the phone jack, not the key jack? Hmmm, no respect for the man around the house. . . . WHO MOVED THE JACKS?)

1305—Boy, listen to that pileup! Here goes . . K4XYZ, this is K2——, copy? Thank you for the report, 59020; your report 50001. My gosh—behind already! "K5ZZZ, here is K2——, do you copy? You're not in the contest? How about a report? Thanks anyhow, OLD MAN! W4YYY, this is K2——, how about it? W4YYY, this is K2——! W4YYY, this is K2——! K4YYY, this is K2——? Oh well, there are others! Better try 20 meters. . . . No luck here! Where is everybody? A contest going on and the band is deader than ——. What a day to pick for a contest! (What was that? Certainly I'm using an antenna! Yes——the BEAM—think I'm STUPID? Never mind the sarcasm—what did you do to the beam? I'm falling behind! Certainly I switched to the——Boy, the beam sure helps!) Now let's get rolling! What the—nobody's listening in the band! Hey fellas, I'm a multiplier too! Well, if you're going to play that way—CQ DX, CQ DX, CQ DX—ah, . . . DL4XX, here is K2——. Oh fine, now I gotta wait on line—you rack up 15 multipliers and I wait for one! The heck with it—back to 15—maybe it's improved!

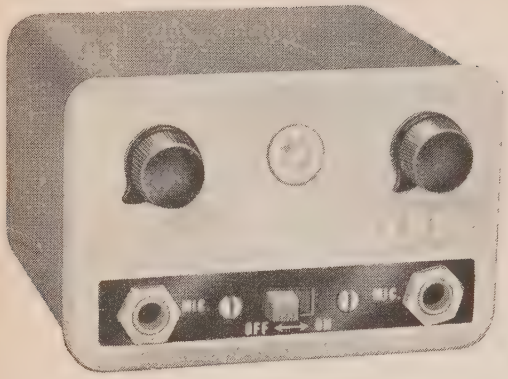
1309—(Shut that darn vacuum cleaner off! Why pick this time to clean the carpet? What? your mother is coming for dinner? In the middle of a contest? Hasn't she anything to eat at home? Waddaya mean I have no respect? Don't I say goodbye when she leaves? Well, put some more water on the soup!) EA7JH, EA7JH. this is K2——; what is my report?——sorry, OM, QRM, please repeat—(Waddaya mean, we're going out for dinner?) please repeat my report—you are 50003—weak, but I can hear you—what is my report?—(the HECK I will get dressed—THIS IS A CONTEST—now look what you did—I lost my contact!)

1320—At last, I've got five solid points—now, let's put the pressure on—W5ZZZ, this is K2—— you're 59006, over—what's that—the call is K5ZZZ and I worked you at 1307? Sorry old man, hard to keep track of all these contacts! 73's and good luck (yaaaaa!). CQ Contest, CQ Contest, CQ Contest, here is K2——. Wouldn't you know it—a ragchew on MY frequency! What about a report, you guys? Waddaya mean by that, friend? It's a free country! What a sore head!

1406—The going is getting rough but the DX is starting to roll in at last—must be something wrong with the path from here—one way skip—nobody hears me—wouldn't you know it—on a day like today! There's a new one-DJØBT—sure could use him for WPX—here we go—oh nuts, where did that AMPY come from —40 over 9 and right on frequency—DJØBT, DJØBT, here is K2——calling—HOORAY, he heard me—DJØBT, your report 59009—over! Get off the frequency, off, I say—off, or I'll never drink a drop of your coffee again! DJØBT from K2—QRM, QRM, — please repeat my report. (Look, Junior, I can't give you a drink now) Please my report (no, not now—ask your mother!) Oh, how I wish I could speak Spanish. (Waddaya mean she's busy? Waddaya think I'm doing?? Okay, stop yelling—I'll take care of you in a minute!) DJØBT, DJØBT, what's my report?—now where did he go to?

1610—Only twenty hours to go—still got a fighting chance—W2000—your report 59012—thanks for my 59063! 63? This guy must be counting everything he hears! Oh well, some guys! Three hours and 63 contacts already! Betcha he doesn't turn in his log! Maybe I'd better hang around this

[*Continued on page 106*]



The Transcon Voxbox

Lee Aurick, W2QEX
Technical Editor, CQ

THE many advantages of "break-in" operation on a.m., f.m. and s.s.b. are well known. The gear for accomplishing this apparently difficult, if not impossible, task is generally considered something to be housed in a 6 foot rack. Now, the Transcon Voxbox, a small handful, accomplishes this feat. Here's how it's done.

There are two controls: the TIME DELAY and AUDIO GAIN. With the TIME DELAY at LO, and the AUDIO GAIN at zero, turn the power switch to on and wait a few seconds for the tubes to warm up. While speaking into the microphone, advance the AUDIO GAIN until the relay is actuated by your voice. With the TIME DELAY at LO, the relay will open as soon as you stop talking; perhaps even between words. You may now advance the TIME DELAY control for any desired interval. If you wish, this interval may even be adjusted anywhere up to several seconds.

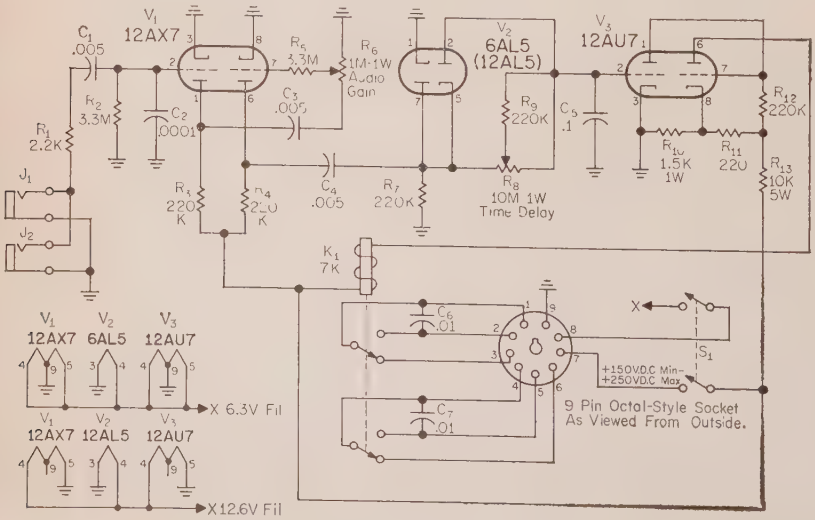
After you have adjusted the TIME DELAY control for the interval that best suits your needs and manner of speaking, it may be necessary to readjust the AUDIO GAIN control. This control is entirely independent of the gain control on your r and will not affect your modulator in any way.

Turning the Voxbox off returns your rig "Push-to Talk" operation. It is not even necessa to remove the microphone from the Voxbox. T MIC jacks are connected in parallel, and your m crophone may be attached to either one.

The Voxbox may be installed in any conveni location, preferably within a few feet of the tra mitter control panel and the station receiver. T double pole double throw relay provides a gr many control possibilities. Generally, the Voxb will be used to replace a low current switch, w the main power change over and antenna chan over still being done by existing relays. In no ca should more than 250 volts d.c. be applied to t relay contacts.

The Voxbox requires 150-250 volts at 30 m Two models are available with different heater v tages, one for 6.3 volts and one for 12.6 volts

The Transcon Voxbox should be of great int est to contest, traffic and mobile operators.



Schematic of Transc Voxbox. Models are av able for either 6.3 or 1 volt heaters.

DX DX DX DX DX DX DX DX

URBAN LE JEUNE, JR., W2DEC

BOX 35, HAZLET, NEW JERSEY

The following certificates and endorsements were issued during the period from October 14th, 1960 to November 14, 1960:—

WAZ

1449	W4GD	John R. Watson
1450	W5BUK	John L. Robertson
1451	OK3KMS	Radio Club PSEE
1452	I1ZN	Giuseppe Zanzani
1453	G6VQ	T. E. Wilson
1454	DL3TG	Kurt Silber
1455	W9TKD	Walt C. Wisnowski
1456	K6LAE	Richard S. Mannheimer
1457	W2ZXL	G. B. Flenner
1458	W2LNB	Phil O'Donnell

CW WPX

144	UC2AA	Valentin K. Benzar
145	W5BUK	John L. Robertson
146	VE3HB	Harold L. Benson
147	K2CPR	J. H. duBois

BAND ENDORSEMENTS

14 Mc. C.W.
W1NLM
W8JIN
K6CQM

14 Mc. PHONE
W8WT

21 Mc. PHONE
W8WT

CONTINENT ENDORSEMENTS

EUROPE

C.W.
K6CQM
W3BQA
W1NLM

PHONE
W8WT

F9IL

Several months ago, I asked for comments concerning the checking of WPX applications out of the United States. The response was overwhelming in favor of having it done this way, and this would, of course, lessen the postal burden on the DX station plus reducing his risk of losing cards.

Once this was solved, an even greater problem had to be solved. In all fairness to the fellows who had already received the award, the same high standards would have to be observed. This requires someone with considerable experience in the checking of cards for another well known award. I am very happy to say we have found our man in Europe. He is Edmond DuBois, F9IL, the DUF award manager for the REF. Henceforth anyone in Europe wishing to apply for WPX should send his application, the necessary cards and return postage to Edmond. When the application is approved, notice will be given to the New York office and the certificate will be mailed from there.

Edmond's full QTH is: Edmond DuBois, F9IL, Aubencheul-au-Bac par Aubigny-au-Bac, Nord, France.

It is a pleasure to have you with us, Edmond.

CR5—Portuguese Guinea—The following letter was received by Bob, K6CQM:

"Thank you very much for the card and California award list you have sent. I hope to get that certificate someday.

"Well, about the CR5 activity, I want to tell you that I'm the only station on the air presently.

"CR5AM, Armando Mariano died a few years ago and his brothers-in-law, CR5AC, Anibal and CR5AD, Octavio, are now off because the first is in Lisbon expecting to get on the air as CT1, Octavio has xmtr trouble but he is very busy with his own job and I do not think he'll be on again for the next few months. I'm leaving CR5 for vacation on the 29th of November.

"I'll be operating from my friend's Garcia, CT1TT, while in Portugal. I'll be back in Bissau around July next year and I'll have a new 3 element beam erected for operation on 14 and 21, my favorite bands. My rig is a two tube 90 watt job and HRO-M receiver. But I'm getting the most out of them.

"I fly as Radio-Navigator for the Portuguese Guinea Airlines. That's the reason why some cards have Senegal stamps attached. My favorite kind of hamming is the experimental. My trouble presently is the QSL handling, though I'm a fine QSLer . . . 130%.

"In 1953 I won a certificate in the ARRL DX Test, but until now I've been QRT in the h.f. bands. I prefer v.h.f. . . . but the activity around here is so insignificant that I only have worked FF8 400 kms away, Hi. . . .

"Well Bob, I don't know yet if I'll be operating my own CT1 station from Portugal, but I hope to join the boys when I arrive again to Bissau.

"I have sent over 500 cards in less than one month which is a good business and I still have about 200 to QSL. HI.

"I hope to see you again on the air, so I must say good luck and fb DX."

Yours truly,
Jose, CR5AE
Jose Dias Coelho,
P. O. Box 77
Bissau, Portuguese Guinea

PJ-Aruba: PJ2AL-Hector—is very active on 10 meters with his home-brew rig running about 75 watts and a 3 element semiwide-spaced beam, NC-101XA-VHF 152A as hearing aid. He is now working for awards. The following has already been obtained. S6S, WAC (Phone-CW), 5ØP5ØW, RCC, S.M.R.A. Award, Kronstad Amateur Radio Award, U. N. Award class 3, and a couple more are on order.

PJ3AD-Earl—is very active on 10-15 phone and 20 c.w. with his Apache, HQ-170 and Hornet tribander combination. He is about ready for 6 meters when the band opens up.

PJ3AL-Max—has been heard testing on several occasions on 28.6. So we expect to hear him on the band very soon with his de-luxe Scout and his tribander (Hi gain).

Thanks to PJ2AL for the above.

VR6 Pitcairn Island: Did you ever win the grand prize at an amateur radio convention? Precious few of us have. Most of us consider ourselves very lucky to stagger homeward with maybe a pair of type 1625 tubes, or a log book, or even a sack of manufacturers literature. Too often the main prize is won perhaps by an 8-year-old girl, who screams: "What's that, Mommy?" or a 75-meter phone man who already has wall-to-wall transmitters, or by an SWL. But, for once, at the Pacific Division ARRL Convention in San Mateo, Calif., last month, the fickle finger of fate took a holiday. In a way, we all won! And thereby hangs a tale. It really should begin: "Once upon a time . . ."

Floyd McCoy, VR6AC, whose faint signals made many a DXer shake with ecstasy some years ago, has been touring the United States with his XYL, Violet, for the past several months. It's their first visit for which they've saved and looked forward longingly for a long time. On their way back westward they happened to be in the San Francisco area, enjoying the warm hospitality of Joe Horvath, W6GPB, and his family, for a week, at the time of the ARRL Pacific Division Convention. Naturally, the sagacious convention committee, which included Paul Wolf, W6RLP, cornered him to participate in the convention. He did so obligingly and was the featured speaker at the DX session, presenting a most interesting two hour program on the life and history of Pitcairn Island, supported by projected color slides. At the DX breakfast the next morning he also gave his impressions of the highlights of his present tour around the United States.

"During his Saturday presentation (the DX session)," writes K6CQM in the October issue of the NCDXC *DXer*, "Floyd made the remark that he would like to put Pitcairn on s.s.b. when he returned home in November, but he doubted whether he could ever save sufficient money to purchase the equipment. The next day, at the convention's suspenseful climax—the big prize drawing—Floyd won the main pre-registration prize, a Hallicrafters HT 37 transmitter. Our own NCDXCer, Howard Hale W6FYM, prize committee chairman for the event swears the drawing was *not* rigged. In any event, we are glad Floyd won the prize. DXers everywhere will be waiting for him to put Pitcairn on the s.s.b. map."

The visit of Floyd and Violet in the W6GPB household did not pass unnoticed by the local press. *The San Rafael Independent-Journal* published a lengthy but interesting article, entitled "Kin of *Bounty* Mutineer Visits Ham Radio Friend in Marin," with a picture of Joe displaying Floyd's VR6AC QSL card for a past contact. Some highlights of that article:

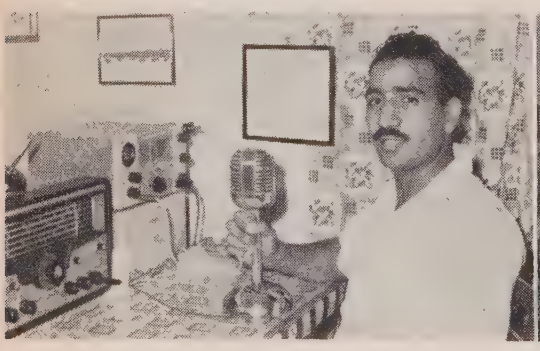
"A Policeman from 'paradise' is a Marin County visitor," goes the newspaper clipping.

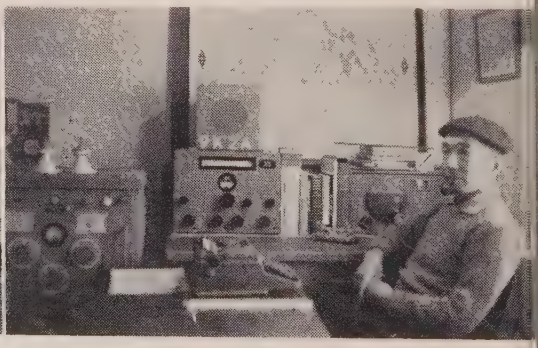
"What he terms 'paradise' is a volcanic semi-tropical island in the midst of the broad South Pacific, where he is Inspector of Police and one-man police force.

"His great-grandfather was a leader of the famed mutiny on the *Bounty*—that uprising against tyrannical Captain William Bligh in 1787 which made Pitcairn Island a speck of refuge on which mutineers' descendents still live. Of these, Floyd McCoy is the first ever to visit the United States, on money earned through service to modern science. He served on Pitcairn as an observer during the International Geophysical Year.

"By beaming the magic of radio across vast ocean wastes as an amateur 'ham', McCoy became a friend of his present host, Joseph Horvath, with whom he is visiting at 522 Third Street.

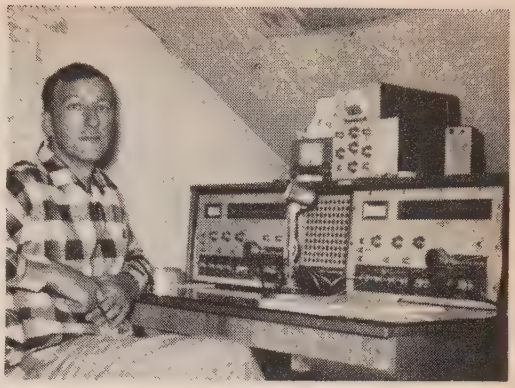
"Pitcairn today is the home of 148 persons who





Two of the most widely worked 9K2's on the band 9K2AN on the left and 9K2AT on the right. (Tnx W5PM)

After a good cup of coffee, Yirka, OK2BAT is ready to give the band a good going over. (Tnx K2UKQ)



Russ, DL4BS, and his very neat Heathkit installation in Darmstadt.

the McCoys are in residence. There, in idyllic, largely communal, life wraps in harmony descendents of five families from original *Bounty* mutineers —the Christians, stemming from leader Fletcher Christian, the McCoys, now about to vanish as a family name, the Clarks, the Youngs and the Browns, to whom must be added some Coffins from America's Nantucket.

"McCoy, 62, has lived a broader life than most on the island. He was away, mainly in New Zealand, for about 20 years during the World War II period, during which he met his wife. They have been on Pitcairn together for the past 13 years. Among the several McCoy occupations is another honorary job as public relations officer, entailing correspondence with philatelists and 'pen pal' clubs.

"McCoy is considered the leading collector of historic facts about the Bounty incident which has been immortalized both in a famed Charles Laughton movie and in a book by Nordhoff and Hall. Stirring indeed is the famed yarn about how, under leadership of Christian, McCoy and Matthew Quintal, the crew of the *Bounty* set the skipper and his crew adrift in a small open boat in which they journeyed 4,000 miles to reach Java. The mutineers sailed the *Bounty* to Tahiti, where some were later captured and executed. Others took Tahitian wives and went on to the then uninhabited tiny Pitcairn, 3,000 miles east of New Zealand and 3,000 miles west of Chile. There they dwelt undiscovered from 1790 to 1808.

"It's a wonderful life, 'comments McCoy,' truly the nearest one could get to Paradise. One American among us, Roy Clark, arrived in 1909 with his father at the age of 12 and he won't come back. One of my jobs is to make contact with a brother down in Oceanside who wants to pay his way for a trip.'

"McCoy is writing a full history of the *Bounty* folk and the island, including the fact that once the mutineers were moved to Norfolk Island, 600 miles west of Australia, in 1856, because Queen Victoria felt better to have us 2,000 miles nearer Australia. But in 1860 many went back.

"Money from scientists in La Jolla provided this trip, McCoy said. He said he had police leave accumulated at a rate of one week a year, good for three months. 'As the job is unpaid,' he said, 'I told them I wanted six months, take it or leave it, and it will work out seven.'

"Going by ship last March 25, to Panama and Texas, the McCoys took bus from Dallas to New York and New England, then journeyed cross country to Seattle and Vancouver, then south, seeing hundreds of 'ham' radio pals everywhere. 'A year from now and we'll not be able to believe we ever were in such an amazing country. But we're taking pictures wherever we go to show the people of Pitcairn all about it.'

"While guests of the Horvaths, they are scurrying everywhere to see everything possible. 'They'll have to carry us when we get home,' predicts McCoy. 'We won't be able to walk after we get out of the whaleboat—our legs won't work proper after all this gadding about by motorcar!"

In some additional notes in the *DXer,* K6CQM reports an interesting article in the October, 1960, *National Geographic* magazine about the *Bounty* descendents living on Norfolk Island. Also: Floyd has held a New Zealand commercial radio license since 1928. He can send and receive c.w. at 30 w.p.m. In 1935 he installed and now operates ZBP on c.w. The reason he can't operate on c.w. or s.s.b. in the ham bands is that his receiver has no b.f.o.

The only other ham operator on Pitcairn, Tom Christian, VR6TC, was in a New Zealand Hospital, and he has been off the air for some time, advises W6RLP. Floyd has also been inactive because of other interests.

To end this Cinderella tale, we are told Floyd picked up an SX-111 companion receiver to go with his new HT-37 in Los Angeles. With a new Mosley TA-33,3-element rotary beam previously obtained, VR6AC can hardly wait to get back to his island and start dispensing those s.s.b./c.w. QSO's with his brand new station."

W6RCD will be his QSL manager.

Thanks to W4KVX's *DX Magazine* for the above article.

The following letter from G2MBS was received by W5PM.

"On 16 Aug. the British Crown Colony of Cyprus ceased to exist and the authority was vested in the independent Republic of Cyprus. However, the British retained two military base areas of total area

99 square miles which remain under the Sovereignty of H. M. the Queen and are administered by the Military authorities. There are two sovereign base areas. The Akrotiri Base area near the town of Limassol and the Dhekelin Base area near Sarnaca. Certain administrative functions in the Base area have been delegated to the Republic of Cyprus, this includes the issue of driving license, etc. This explains why amateurs in both parts of the Island still sign ZC4. I understand that the country status here is being investigated by ARRL, but I don't know the outcome of this. There seems to be a good claim for separate countries based on the differing sovereignty of the two parts of the Island."

ZD1-Sierra Leone: "Was just informed by Alf Wilson, ZD1AW, that he will be closing down on Oct. 25th and returning to the home QTH in Belfast, Northern Ireland. He will be enjoying leave time until May 1961, after which he will be seeking re-assignment. For his 13 months of activity in Sierra Leone, Alf comments: "It will be with a considerable amount of regret that I close down ZD1AW. It has been a wonderful source of enjoyment for me during the past 13 months. I have made lots of friends and have had lots of fun all around."

I will have ZD1AW final log copy shortly, and will continue to acknowledge all QSL requests accompanied by the usual SASE. With Alf closing down, Sierra Leone will still be active with ZD1CM, Charlie Marks, who has about a year to do yet on his current tour of duty."

Thanks to W3KVQ for the above letter.

ZD2—After October 1 when Nigeria becomes independent, the Cameroons will remain under British Trusteeship. The ARRL have informed ZD2KHK who will be at Mibi, Br. Cameroons for a year that the Cameroons will probably count as a separate country. ZD2KHK, KHP, PJB are new licensees here, all are interested in s.s.b. ZD2KHR, also in Br. Cameroons says he will be pleased to supply some activity from this spot if separate country status is granted. ZD2GWS also residing in Br. Cameroons. (Tnx *RSGB Bulletin*).

ZL1-Kermandec Islands—From Jock, ZL2GX, we hear that a good friend of his will be going to the Kermandecs in late 1961.

5N2 Nigerian Republic: On the 1st of Jan. 1961 at 0001 GMT all ZD2 stations will become 5N2 retaining their suffix. Nigerian Independence became effective at 2300 GMT on Sept. 30th, 1960. The first station to work the new republic was K2DCA who worked ZD2JM at 2304 GMT, the next four stations were W4FIJ, W2BZG, W3WNC, and W9SFR. (tnx K9EZA).

160 Meters

ZC4AK Cyprus—Good news comes from Steve, G3MBS (now on Cyprus with R.A.F.) that he will be on 160 this winter. He has already fired up the rig and worked a number of Gs and will be on for the regular 1960/61 Transatlantic DX "Tests," ARRL and *CQ* DX Contests, and in addition will give a "Listen" each morning where possible, between 0430 and 0455 GMT. Covering 1800-1825 kc carefully. He will probably transmit in th vicinity of 1827 kc. Steve is using a DX-100.

DL1FF Armin & Co.—Thanks to W2UWD w have the fb info via 7 mc direct from Armin, tha he has just received his special license for 160 an will be on this season starting Sunday, October 30th around 1827 kc between 0400-0600, and will als at times use any freq between 1825-1835 kc. Alsc of importance is the fact that a large number c other DLs will be on 160, as follows: DL3BE GZ, JE, OO-DL6TO, VN-DL7AA, AB, CY, DZ DL9JL, KP, DL1BA, CF, BZ, GA, IX, KO, LE VU, YA, DJ1BZ, CX, DJ2GL, KS, DJ3BA, JZ, KE NO, DJ4AJ, CG, JI. Armin will use a 120 ft vert cal antenna soon.

160 Meter Award—Available from W8QHW, Rc Havlicek, 3156 Timberview Drive, Cincinnati 1 Ohio—Cost for materials, etc. $1.00. This a v.f. certificate in green and red called "W-160" ar states . . . This certifies that . . . . . operator has shown true Amateur skill in t operation of his equipment on the one hundred ar sixty meter band, by submitting satisfactory proof communicating with at least 10 countries using c. and phone" . . . Here's a chance, you 160 meter fe lows, to hang up another certificate—write D listing 10 countries—stickers may be furnished lat for each additional 10 countries. First 10 certificat went to stations in this order—W1BB, W2EC W9PNE, OK1EH, W8KIA, KP4KD, W6YM OH2YV, DL1YA. Thanks to W1BB for the 1 meter information.

Certificates

Golden City Award (GCA)

This award is issued by the Johannesburg Bran of the South African Radio League.

Requirements:

a) Amateurs in Zone 38 must work 30 differe amateur stations in Johannesburg.

b) Amateurs in the rest of the world must wo 15 different amateur stations in Johannesbu

Contacts can be made on any of the amate bands phone, c.w. or mixed, with minimum repo of RS33 or RST338 and contacts *from and includi the 30th May, 1960 only* will count.

QSL cards, together with a list of contacts, p 5 IRCs or British Postal Order for 2/6 to be sent The Awards Manager, GCA, P.O. Box 23 Johannesburg, South Africa.

For every additional 5 stations worked in Joh nesburg, a sticker will be issued at a cost of one I or British postal order for sixpence for each stick QSL cards required.

W.L.H.R.C.

The Lion's Head Radio Club in Cape Town of the following certificate.

W.L.H.R.C. offered to licensed amateurs throu out the world for 2-way contact with members the Lion's Head Radio Club as follows:

Zone 38	5 members
Rest of world	3 members

There are no limitations. The award can be h for any or all bands. Also for any or all modes

smission. Certificates will be suitably endorsed. lo QSL's required; only list showing necessary ils. However, members *must* have received ap- ant's QSL before the award can be issued.
Only contacts from 1st October 1960 qualify.
Applications to be sent to Max Adler, ZS1ACD, . Box 1167 Cape Town. A fee of $1.00 or 7 (or equivalent in British Postal Orders) is re- ed.
L.H.R.C. This award for s.w.l. with same rules above plus that s.w.l. must show on their the call signs of *both* the member and the sta- in QSO with that member.
ctive members of LHRC include: ZS1, AB, ACD, NE, OA, MW, JD, RJ, RZ, RZ, TP, TZ, VK, .
he certificate shows, in color, an aerial view of part of Cape Town which surrounds Lion's d and where our members are located.
hanks to K6BX for the above information.

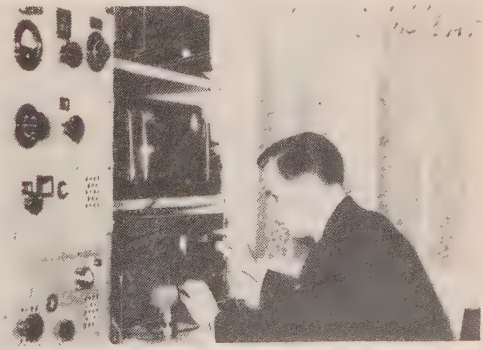
Here and There

ohn Costas of General Electric is co-inventor of ew radio communication system which discards pletely the idea of narrower and narrower band- hs to create more spectrum space. John's gim- k, called Phantom L, uses dual single sideband system several hundred kc wide. Conventional ow band receivers like ours won't hear it except aps as weak, random noise. Conventional trans- ions can stay where they are, mebbe, mucking he band as much as they like.
ecret of detecting the Phantom L signal is to v what signal waveform is being used and to tune Phantom L receiver accordingly. Several trans- ions can be multiplexed c.w., RTTY or what you. The key is the waveform. And there are reds of thousands which are practical. No mat- ow much an eavesdropper knows about the sys- he can't copy it, nor can he jam it, without ise knowledge of the waveform in use. The will operate on any frequency, high, ultra or Tests are now going on at GE. *Please* . . . no cations for "Worked 100 Phantoms" . . .
R3L has been very active on Christmas Island oth 14 mc c.w. and s.s.b. around 10-11 GMT 36BH active on 21 mc a.m. will soon be s.s.b. 09AM, active on 28 and 21 mc a.m. and 14 mc both at 07-09 and 19-21 GMT, will be there ner year—VK9ANB is a new station on Nor- Island, look for him around 0630 GMT on 14 one—ZL4JF, Campbell Island is now QRT and eplacement is not a ham—VKØ's IT, OF, IB, and RL are on Mac Quarrie the other VKØ's n Antarctica. No heard Island activity—ex GW is now stateside and probably will not re- He visited K2GMO and several of the NJDXA on his way to Washington, D.C. He has all of gs with him and may be reached at K3KJF— F may DXpedition to ZA land soon—VP8EG, Orkneys, may be found almost daily on 21 mc

[*Continued on page 110*]

Odd, LA2TD/P, has just returned from two years of Spitzbergen. He is pointing to his cold outpost on the map. (Tnx W5PM)

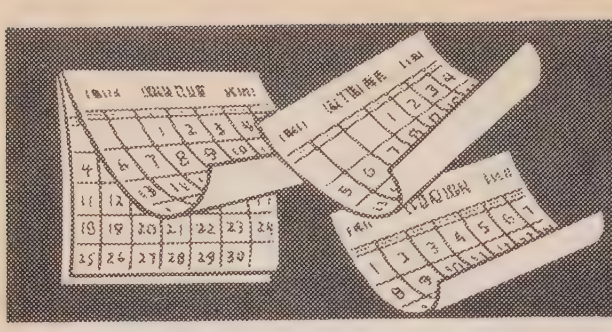
Don, W7ZOH, has the distinction of being the only WAZ holder in the state of Montana. The rig shown here plus a Mosley beam were used for all contacts.



It looks like we have caught UR2AT trying to pull a rare one out of the noise. (Tnx W5PM)

Ownership Statement appeared in the November issue giving a figure 36,498 as representing the paid circulation. Of course that did not include the copies of CQ sold via news stands, singly by direct-mail, or over dealer-jobber counters. The gross total ion from *all* sources combined is close to 90,000 copies.

S. R. COWAN
Publisher



CONTEST CALENDAR

by Frank Anzalone, W1WY
14 Sherwood Road, Stamford, Conn.

CALENDAR OF EVENTS

January	14—15	DARC WAEDC
January	14—15	New Mexico Party
January	28—29	*CQ* WW DX S.S.B.
January	28—29	Kansas Party
February	3— 5	ARRL DX Phone
February	10—12	QCWA QSO Party
February	17—19	ARRL DX C.W.
February	24—26	*CQ* 160 C.W.
February	25—26	YL/OM Phone
March	3— 5	ARRL DX Phone
March	11—12	BERU
March	11—12	YL/OM C.W.
March	17—19	ARRL DX C.W.

CQ WW DX Phone Contest Claimed Scores

All Band

KH6IJ	312,223	PY3AHJ	73,359
ZK1BS	188,496	W9EWC	72,834
9U5PD	186,923	KZ5TD	71,712
KW6DF	121,030	W4OM	71,574
OD5CT	119,048	9G1DP	59,427
XE1SN	90,390	HS1B	51,562
DL4PI	90,139		

28 Mc.

CX1AK	98,196	W8UMR	8,692
ZS7L	35,160	K6CT	8,190
W5LGG	10,896		

21 Mc.

KR6IM	25,165	I1ZLW	11,748
CP5EL	19,590	TI2RO	9,024
W2WZ	12,540		

14 Mc.

YV5AKP	50,635	DL4ED	25,179
W1ONK	35,944	ZL4LB	16,165
W3JTC	25,380	SVØWL	14,539

7 Mc.

K2DGT	3,159

Multi-Operator

CN8HX	383,362	K6EVR	81,788
K2GL	383,112	W8NGO	55,257
ET2US	258,427		

Helvetia 22—1960 Contest Results

European Winners

DJ2IB	9360	SP6AAT	107
OH2FS	4836	UP2AT	100
PAØVB	4590	LA3UF	99
YU2HO	4032	G8QZ	9
LX1DE	4032	I1FMC	3
SM5TW	3408	TF3AB	
ON4IX	1800	OE6ST	
OK2KMY	1710		

Non-European

EL1I	1710	K4IEX	
EL1K	1152	K8LTZ/VO1	
W1WY	540	K1CXP	
FM7MU	530		

DARC WAEDC

Starts: 05.00 GMT Saturday, January 14t
Ends: 23.00 GMT Sunday, January 15th

This is the 6th year the DARC is sponsorin WAE contest. The format remains the sam this year the contest has been wisely cut do one week-end. Its a c.w. contest only and th ject is for non-European stations to work as Europeans as possible on all bands 3.5 thru 2 There is also a QTC feature for extra points. check last month's CALENDAR for details.

It is also suggested that the DARC log for used. A large self-addressed envelope with 2 (5 IRCs for Air Mail) will bring you a supply. logs must be mailed not later than March 31st Send to: The DARC DX Bureau, Fuchsienwe West-Berlin-Rudow, Germany.

New Mexico

Starts: 8.00 A.M. MST Saturday, January 14
Ends: 8.00 P.M. MST Sunday, January 15

The Sandia Base Radio Club is promoting i New Mexico QSO party. Falling on the same end as the DARC contest presents a proble this offers an opportunity to work the fairly state of New Mexico. Check last month's CAL for Club frequencies and rules of the contest. must be postmarked no later than February and go to: The Sandia Base Radio Club, Att: Kanode, K5UYF, 408½ Cornell Drive S.E., querque, New Mexico.

CQ WW S.S.B.

Starts: 15.00 GMT Saturday, January 28th.
Ends: 21.00 GMT Sunday, January 29th.

This one is building up to being the most popular of all Phone contests. If you don't think so just listen to the activity the last week-end of January.

There will be sectional certificates and two trophies to the top men in the contest. There is a power division giving the 175 watts and under a break. Operation is also limited to 24 hours out of the 30 hour contest period. Dorthy and Irv gave you the low down in their SSB Column of November.

Your logs go to the *CQ* WW SSB Contest Committee, 12 Elm Street, Lynbrook, N.Y.

Kansas

Starts: 14.00 GMT Saturday, January 28th.
Ends: 23.59 GMT Sunday, January 29th.

The Kansas Federation of Amateur Radio Clubs has organized a QSO party to celebrate the 100th anniversary of the entrance of the State of Kansas to the USA.

Kansas stations can work other Kansas stations, USA stations and DX stations on both phone and c.w., there being two separate divisions for them. Stations outside of Kansas of course will try to work as many Kansas stations as possible on both phone and c.w. but it will be treated as one entry only.

Your QSO should have the signal report and your location/multiplier. For Kansas stations the location/multiplier is their county. Out of state W/Ks and VEs will give their ARRL section, and DX stations their country.

No number is required and should not be given.

The same station may be worked on more than one band for point credit but not for an additional multiplier.

Each contact counts one point but a county, section or country can be counted only once as a multiplier.

Certificates will be awarded to the winner of each section and in each country.

The top 25 Kansas c.w. contestants and the top 25 phone entries will also receive certificates.

Following are suggested frequencies to watch: 3550; 3900; 7050; 7250; 14,050; 14,250; 21,050; 21,350; 28,050; 29,000; 52,000 and 144,500.

Your logs must be in the hands of the Kansas Centennial QSO Party committee, 414 Avenue C, Wichita, Kansas, before March 15, 1961.

There are two additional awards for the 1961 calendar year. The Sunflower Centennial Certificate awarded to any USA amateur who can prove contacts with 25 Kansas stations (non-USA need only 10) during 1961. And the Kansas Centennial Trophy awarded to the station working the most Kansas stations during the 1961 calendar year.

1. A trophy to the Kansas station working the most Kansas stations.

2. A trophy to the non-Kansas USA station that worked the most Kansas stations.

3. A trophy to the DX station that works the most Kansas stations.

Send your application with date and time of claimed contacts. Do not send QSLs, however the committee may request all or part of your QSLs at a later date. More details can be had by writing to: The Kansas Centennial Committee, 1203 East Douglas, Wichita, Kansas.

ARRL DX

It's the World working the USA in this one, *QST* will have all the dope in this month's issue, so we refer you to them.

QCWA

Starts: 18.00 PST Friday, February 10th.
Ends: 18.00 PST Sunday, February 12th.

This year's party of the Quarter Century Wireless Association is sponsored by the Southern California Chapter. It's primarily a QSO party so there is no scoring except the number of QCWA members contacted.

Your log should show in this order: Contact number, date, time, station worked, his location, frequency, name and QCWA number. Operation will be confined to spot frequencies (plus or minus 5 kc.) as listed below.

C.W. . . . . 3655, 7005, 7115, 14110, 21110, 28110.
A.M. . . . . 3810, 3950, 7230, 14240, 21340, 28900, 50200.
S.S.B./L.S.B. . . . . 3990, 3999, 7204, 7218, 7299.
S.S.B./U.S.B. . . . . 14345, 21440, 28690, 50210.
RTTY . . . . . 7105, 14140, 21150, 28280.

To make it more interesting a suitably engraved plaque will be presented by the National Headquarters to the "Top Banana" in the party. However he does not retain permanent possession of the Trophy until he wins it three times. In the meantime it makes the rounds to each year's winner.

In addition, the Southern California boys are donating a TH-4 Thunderbird Hy-Gain Beam, so it looks like the Ole' Timers will be up, burning the midnight oil for this one.

Your logs go to: Ted Lowe, K6FH, 425 West Almond Street, Compton 3, Calif.

CQ 160 CW

Starts: 9.00 P.M. EST Friday, February 24th.
Ends: 9.00 A.M. EST Sunday, February 26th.

This is the Second Annual *CQ* 160 Meter c.w. Contest. A total of 286 stations in 34 states, 4 Canadian provinces, British Virgin Is. and England participated in last year's contest.

The contest is primarily for the US and Canada areas but stations in other countries are invited to work W and VE stations. Operation of course is limited to c.w. only. Rules are simple.

1. Two points for each QSO between stations within the US and Canada, 5 points for QSOs with a foreign station.

2. A multiplier of 1 for each state, Canadian province and foreign country worked.

[*Continued on page 112*]

by DONALD L. STONER, W6TN
P.O. Box 137, Ontario, Ca

Novice

The output voltages, in the rectifier circuits discussed in the past few columns, are not suitable for supplying d.c. to most vacuum tubes because of their pulsating voltage output. The variations in the direct voltage are known as *ripple* voltage. Ripple voltage may be thought of as an alternating voltage superimposed upon the direct voltage. Actually the ripple voltage is composed of a fundamental frequency (60 or 120 cycles, depending on the power line frequency) and a number of harmonics (harmonic frequencies are multiples of the fundamental). The fundamental is equal to the input frequency if the rectifier is a half-wave circuit, or, twice the input frequency if the rectifier circuit is full-wave. The amplitude, or voltage, of the fundamental ripple will always be greater than any of the harmonics. For power supply purposes, the ripple voltage must be reduced to a low percent of the d.c. output voltage. A device for eliminating ripple is called a *filter*.

A filter usually consist of capacitors connected in parallel with the load and inductors connected in series with the load. A capacitor opposes any change in voltage across its terminals (across the load) by storing up energy in its electrostatic field whenever the voltage tends to rise, and converting the stored energy back into voltage whenever the load voltage tends to decrease. An inductor opposes a change in current through it (through the load) by storing up energy in its electro-magnetic field when the current tends to increase and by taking energy from the magnetic field to maintain the flow when the voltage tends to decrease. Thus as the ripple tends to increase or decrease (its individual alternations), these components "gang up" to oppose the change.

Another way of looking at the action of a filter circuit is to consider that the capacitor forms a low resistance path to ground for the ripple voltage and offers a very high resistance to the d.c. The inductor, on the other hand, offers a low resistance to d.c. and a very high resistance to the ripple volta Either way, you look at it, the filter network provi a reduction in the ripple voltage without adver affecting the d.c. output of the power supply.

Capitance Input Filter

One type of filter is the capacitance input pi-ty of filter, as shown in fig. 1. It is called a pi-fil because the components (drawn schematicall form the shape of the Greek letter π. The out of this filter will almost equal the *peak* of the a applied to the rectifier, at low currents. Howev the voltage falls rather rapidly as the current dr increases, reaching as low as 90% of the r.m.s. value when full rated current is drawn by the lo This fall of voltage under load conditions is refer to as *poor regulation.*

An important feature of this filter is the *blee* resistor. It is used chiefly to "bleed off" or discha the voltage remaining on the capacitors when equipment is turned off. A bleeder resistor sho draw 10% or less of the rated current output of power supply.

Choke or Inductance Input Filter

Another type of filter is the choke input circ which is illustrated in fig. 2. When the tubes sociated with the load draw no current, the cho input filter keeps the voltage at practically the sa value as an unloaded capacitance input filter. Ho ever, when a small amount of load current is dra the voltage drops rapidly to a value which rema fairly constant over a wide range of currents. Reg lation is good after the first or initial drop. If bleeder resistor is large enough it will draw su cient current to provide the initial voltage drop. regulation curve for typical choke and capaci input filters is shown in fig. 3.

There are many other types of filters but the acti of each is much the same as the two popular c

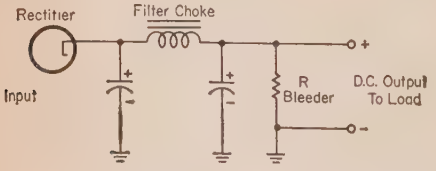


Fig. 1—The capacitor input filter is the most common filter circuit found in amateur equipment. It has higher voltage output but poorer regulation than the choke input circuit, fig. 2.

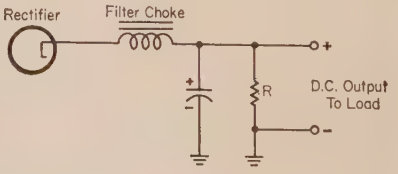


Fig. 2—The choke input filter circuit is often used in high power transmitters, or wherever a degree of voltage regulation is desired.

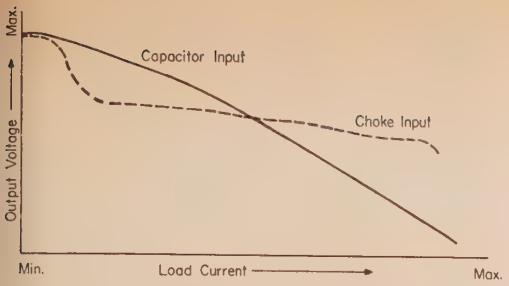


Fig. 3—A graph showing a comparison of regulation characteristics for the choke and capacitor input filter circuits.

cuits just described. Sometimes the inductor is replaced by a less expensive resistor, but the resistor has the disadvantage of offering as much resistance to d.c. as to the ripple voltage. In some applications, tuned or resonant circuits are used to "trap out" particular ripple frequencies. For example, a series resonant circuit in parallel with the load provides a low resistance path for the ripple. A parallel resonant circuit in series with the load forms a high resistance path, thereby blocking the ripple, yet permitting the passage of d.c. to the load.

Voltage Regulators

Many amateur radio circuits, such as those used n receivers and v.f.o.'s, require very stable plate voltages for optimum results. Let's look at some of he circuits designed to maintain the output voltage of a power supply constant even when the input voltage or load current varies.

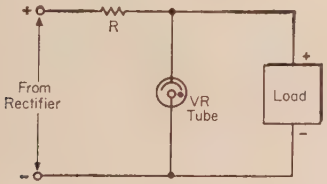


Fig. 4—The gas regulator tube is capable of maintaining a voltage within narrow limits, in this circuit.

Figure 4 shows a simple voltage regulator circuit. t uses a v.r. (voltage regulator) tube which has a constant voltage drop across it, over a wide range of oad and supply currents. In operation a typical v.r. ube, the VR150-30, draws up to 30 ma. and mainains a voltage across its terminals of 150 volts. If he input to the regulator should rise, more current would flow through the v.r. tube and there would be greater drop across resistor *R*. This voltage drop would subtract from the rising voltage and tend to naintain the voltage across the load. On the other and, if the input voltage falls, the v.r. tube will onduct less current, the voltage drop across *R* will e less, and the voltage across the load will remain t the desired level. When the load draws more urrent, the voltage tends to drop because of the oltage drop across *R*. The v.r. tube compensates for his by conducting less, decreasing the total current hrough *R* and, as a result, maintains the load volt-ge constant. Regulation with this circuit is satisfactory as long as the current conducted through the v.r. tube remains between 5 and 30 ma.

Electronic Regulator

The electronic voltage regulator shown in fig. 5 is capable of very close regulation at a level which may be set by varying the potentiometer R_1 setting. This circuit uses a vacuum tube (V_1) in series with the load. The voltage across the load is regulated by controlling the conduction of V_1, that is, making V_1 act as a variable resistor that automatically adjusts itself to the correct value. Note that a v.r. tube is used. Its purpose is to provide a fixed reference to which the load voltage can be compared and corrections made by V_1, if necessary. Tube V_2 compares the load voltage (on the grid) with the reference (on the cathode) and feeds the corrections to the current passing tube, V_1.

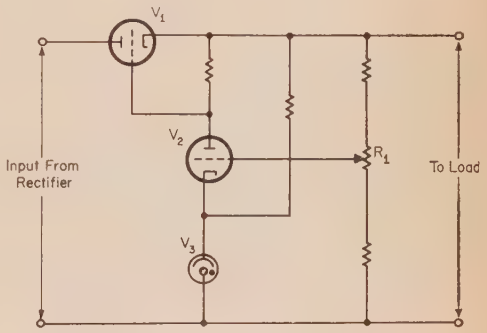


Fig. 5—When extremely close voltage regulation is required an electronic circuit such as this can be used.

Universal Power Supply

A simple power supply which you can build is shown in fig. 6, and in the accompanying photographs. The circuit is designed to provide the correct voltages for the Heath Comanche mobile receiver, when used in a fixed location.

The circuit is the full-wave rectifier which we discussed several months ago, feeding a capacity input pi-filter. The rectified output is 350 volts under load. Two 6.3 volt, 3 ampere filament windings are provided. These can be connected in series for 12.6 volts at 3 amperes, or in parallel to obtain 6.3 volts at 6 amperes.

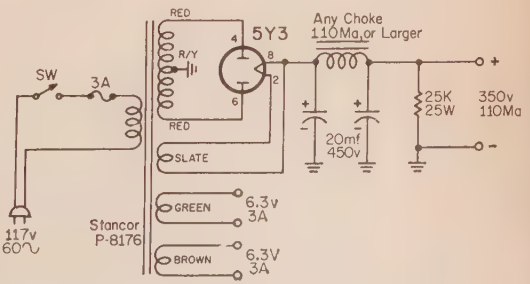
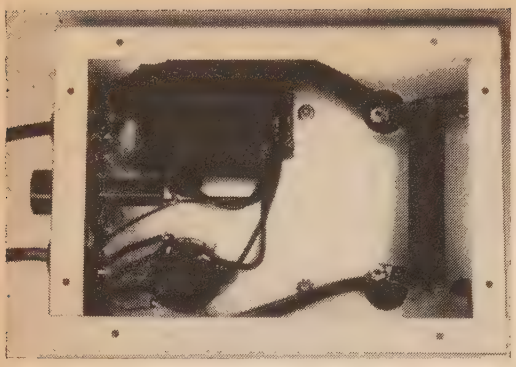
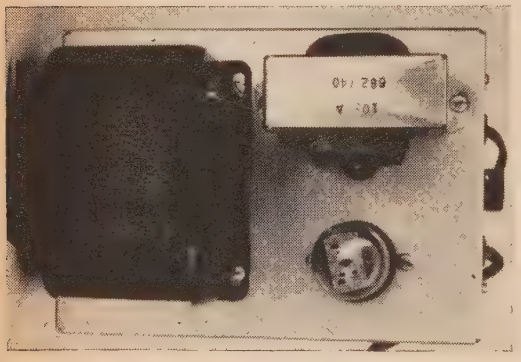


Fig. 6—Schematic diagram for the "Universal Power Supply."



Underside view of the power supply. The bleeder resistor is mounted at the opposite end of the chassis, from the filter capacitors.



Top view of the "Universal Power Supply," showing the relative placement of the components.

The construction is straightforward and little need be said about assembling the components; the layout is in no way critical. The bleeder resistor and electrolytic capacitors (filter) are located under the chassis along with the fuse holder and wiring.

If the voltage output is too high (350 volts), it can be reduced, and the regulation improved, simply by removing the input capacitor in the pi-filter.

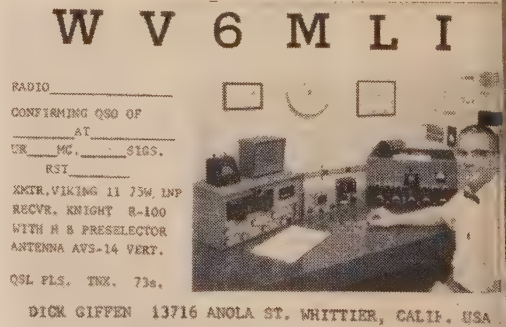
Who's DX?

Ray T. Brooks, K2LTX/MM, is the radio officer on the M/S *Dynafuel* and operates on 7 mc with one-half watt input. Ray is looking for Novice contacts on 7153 kc and his best DX to date is 3,000 miles! Ray writes "The following Novice stations were logged by me on March 31, 1960 from 0430 GMT to 0730 GMT on 3.5 mc in position 40° 30′ North, 31° 30′ West (60 miles north of Flores, Azores): KN1MOW, NKQ, NPA, NYY, WV2GYI, JDZ, JLH, KAP, KN3HAD, IJS, KMB, KOQ, LBD, LEJ, LEQ, KN4HRW, PLD, TKI, KN5AJH, ZQX, KN8PYR/8, PYZ, QCC, QPW, SLU, KN9SBI, TBZ, VWM, VZH, WEK, WET. On April 1, 1960, at 0723 GMT, 3.5 mc, KN5AJH (QTH 100 miles north of Terceira, Azores). On April 22, 1960, from 0225 GMT to 0420 GMT on 3.5 mc, while docked at Ceuta, Spanish Morocco: KN1KNH, MAV, MYZ/8, NGF, NTN, NUU, NWI, NYT, OBT, WV2FOI, ILK, JLZ, KAP, KBP, LAJ, LYF, KN3KTC, KTX, KN4KYD, QXJ, QZY, VBU, WHK, KN8ILH, RAI, SGJ, TGY, KN9UXW, KNØLFG." Ray continues, "All the stations were heard with fair to very good signal strength." If you have never worked a maritime mobile station (or even if you have), give a list for Ray.

Faithful reporter, Ivor Stafford, VK3XB, Byron St., Box Hill Sth., E11, Victoria, Australia needs only New Hampshire and Utah to complete a WAS in 7 mc Novices. To date Ivor has worked 330 Novices and had 400 contacts with them on 7 mc. He will run skeds with any Novices, but of course the above two states would really be appreciated. Ivor's letter continues, "I call a lot more than I work, these days, but conditions will be good again when the fellows learn of my activity. The following Novices were heard and worked between Aug. 5th and Oct. 15 (worked stations in italics): KN1OLP, NSH, MXR, WV2OAC, LEY, KN3KSY, *LEO*, MPN, *LGU*, LSC, *LET*, NFO, KTT, LXY, KN4BAQ, BTU, UXD, WKF, WKQ, WNA, WVY, YEJ, YPN, YXN, KN5ARG, BDQ, BMJ, CCJ, DHG, DSI, DUI, EUR, ZOS/7, WH6*DSF*, DUJ, DUX, DVJ, WV6JCF, KJN, KRY, KXN, LAB, LPW, MVF, MWG, MZU, NCU, NOP, TH

[*Continued on page 110*]

Meet Al Bogdon, KN9YJQ, 5546 So. Nottingham Ave., Chicago 38, Illinois. Al's antenna is a homebrew ¼ wave vertical 32′ 6″ high which he uses as is on 40 and with a base loading coil on 80 meters. The antenna is constructed of 10 foot section of heavy duty aluminum conduit.



Dick Giffen, WV6MLI sends us this homebrew card. Does the shack always look this neat OM?

ham clinic

CHARLES J. SCHAUERS, F7FE/W6QLV

C.Q. Magazine, 300 West 43rd St., New York 36, N. Y.

CB Operation And The Ham

When we hams lost the 11 meter band to a Citizens Radio service, many of us were downright angry and dismayed—we really felt lost and maligned.

Those not in the know even went so far as to accuse certain manufacturers of being behind the FCC decision to create the CB service.

The few hams who used the 11 meter band frequently to escape the QRM on 10 meters were the most outspoken and when the CB came into operation, there were a number of clashes between the CB users and some of the 11 meter bands' ex-occupants.

The clashes precipitated by disgruntled hams consisted of zeroing-in a 5 watt CB station and generally jamming it off the air with 50 or more watts of power. Such tactics!

This method of trying to make it hard for the CB operator to carry on his communication not only contravened existing FCC regulations but also created a lot of ill-will between some CB and ham operators.

Sorry to say, there are still a few hams who persist in putting their rigs on 11 meters to harass the CB operators. Perhaps they do not cherish their ham licenses; for they can lose them if they are caught.

So far, the CB has proved to be a good thing. For sure, 11 meters is now fully occupied (which it was not when the hams had it), and is contributing a good deal to public service.

Now here is the point of this lead-off: many users of the CB channels *are* hams; for they realize the value of a radio communications service that permits them to talk with their homes, offices and other points of *permanent* personal interest.

Actually, we hams have not really *lost* the 11 meter band—we have gained another service. For remember, with the technical and operating experience gained by operating on the ham bands, the use of CB equipment on the CB channels presents no "transitional" problem. We who are hams and CB users can get the *most* out of our CB rigs; something that the newcomer is strapped to do.

Those hams who got their first taste of radio communication via CB channels will attest to the fact that it does whet the appetite for ham operation. It is good "on-the-job" training for the ham radio hobby and should be encouraged.

Hams who deliberately out of spite or malice jam CB channels should do a little thinking. They are only hurting themselves and giving amateur radio operation a "black eye." If they are caught (and they eventually will be), they can lose their licenses —this is not good for them or for ham radio.

Observation

The Single Sideband Amateur Radio Association (SSBARA) is growing by leaps and bounds. As its objectives are more widely publicized, this stalwart group will certainly become larger and thereby contribute more to the enjoyment and technical progress of ham radio, with emphasis of course, on s.s.b.

The one major objective of the SSBARA is the furtherance of s.s.b. This means that those who are not now using s.s.b. are encouraged to look into it and on the basis of its current technical perfection, decide whether they should or should not join the ranks of their "heterodyneless" ham friends.

Single side band needs relatively little selling technically because it virtually speaks for itself. But the SSBARA is doing much more than advocating the use of s.s.b.

First of all, the Association brings together hams from all walks of life who have more than just a common interest in ham radio operation. Also too, by publicizing s.s.b. and thereby bringing in more s.s.b. stations, more operating space is made available. For let us not forget, the well-adjusted s.s.b. station requires only ½ the frequency space of the a.m. station.

The SSBARA also encourages better operating practices and encourages technical perfection. A mis-adjusted s.s.b. rig is just as bad or worse than an over-modulated a.m. rig.

Because vox is used more often than not in s.s.b. operation, there is an immediate intimacy created between contactees. There is no long wait to express your own ideas; you talk as you do over the telephone.

Another thing that the SSBARA does not realize it is doing by encouraging greater s.s.b. participation, is encouraging the ham manufacturing industry to produce more and better gear. In other words, they are sparking competition. We in America know what this means—the best equipment at lower prices.

But the outstanding accomplishment of the

SSBARA I believe, is its creation of a new atmosphere among large groups of radio amateurs. This atmosphere makes operation on the bands and attendance at meetings (especially the famous S.S.B. Dinner) one of real heartfelt comradeship. For the common ground on which the s.s.b. enthusiasts walk is something more than just owning and using s.s.b. equipment or just being a radio amateur.

The SSBARA publishes *The Sidebander* which is edited by our own s.s.b. columnists, Dot and Irv Strauber (K2MGE and K2HEA). This newsy little publication keeps sidebanders abreast of what the Association and its members are doing. And because Irv and Dot participate actively on the bands and are up to their necks in s.s.b. in all of its phases, including DX, contests etc., they are able to produce really fine material not only for the *Sidebander* but their column in *CQ* as well. How they manage to do all they do, I do not know; but they certainly are real fine people and fine hams.

Observed: SSBARA needs more members and more support for its very worthwhile objectives. If you are interested in s.s.b., and want to join the Association, drop $3.00 in the mail with your name, address and call to: SSBARA, 12 Elm St., Lynbrook, N.Y. I recommend it!!

Questions

6 Meter Antenna—"How about a recommendation for a 6 meter antenna (not the run of the mill) that has been tried and proven its worth?"

There are a number of good v.h.f. antennas that work fine on 6 meters. Personally, I'm partial to the Yagi.

Something just a little different? Well, why not try K4CJS's take-off on the "Wonder Bar?" He swears by it.

See Figure 1 for construction details. George says that it works very well with his Heath "Sixer."

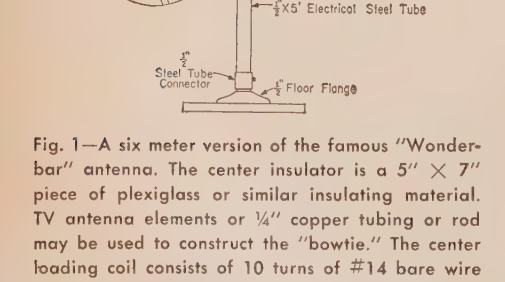


Fig. 1—A six meter version of the famous "Wonderbar" antenna. The center insulator is a 5" × 7" piece of plexiglass or similar insulating material. TV antenna elements or ¼" copper tubing or rod may be used to construct the "bowtie." The center loading coil consists of 10 turns of #14 bare wire 1" diameter and spaced ⅛" between turns, with a 2 turn link of #14 plastic covered wire around the center. Adjust for minimum s.w.r. by varying turn spacing.

Thanks so much for the info George and 75!

Viking Ranger—"Of late, I noticed that m Viking Ranger "down modulates." What should look for?"

First thing to do is to check the excitation to t final. Make sure that you have enough drive around 2½ to 3 mils. Next, check your final p loading to make certain that your antenna is taki power. Check band switch connections and fina the 6146 tube in the final.

6146 Oscillation—"I built up a final (all ban using a 6146 in Class C. I use a pi-output networ On the higher bands the 6146 takes off. Any tips

Yes. Be sure you have a parasitic choke in seri with the final plate of the 6146—about 6 turns number 18 enameled wire wound on a 100 Ohm watt resistor. Put a 47 Ohm ½ watt resistor in seri with the 6146 grid. Make certain that input and ou put circuits of your final have sufficient separati or are shielded from each other. Make sure that y do not have excessive plate and screen voltages.

If neutralization is necessary, try a piece of # copper wire (connected to the outside of the pla parasitic choke)—near it, another piece of wi connected to the 6146 grid input circuit (abo ground). Use an isolating capacitor for the co end of your tuned grid input circuit. Try 2½ lengths of wire over which you have slipped a pie of insulating tubing (spaghetti). Follow nor neutralization procedures as given in the handboo i.e., plate voltage off of final—excitation on—a grid dip meter used in diode position to detect rf final output circuit. Adjust wires against each ot for minimum rf reading on the g.d. meter.

Fuses—"Take another look in the various radi handbooks and you will see that most of the ri described therein are *not* fused. I'm just a Novi and don't know too much about anything yet, b it seems to me that all rigs should be fused. Wha your opinion?"

I did take another look at some of the handboo I have and you are 100% correct! My opinio Well, I think *every* rig should be fused too. Let hope that those who prepare the various radio han books will indicate the *proper* fusing for the ri described, in future issues.

Stored Shock—"Sometime ago when building u a linear final power supply, I used a number electrolytic capacitors of very high value. Well, aft trying a couple of these surplus 'goodies' I put the on the shelf and then forgot about them. One da my mother came in to tidy up my shack (as mar mothers do), and in dusting the shelf where the two capacitors were stored, she brushed her han against one of them and received a nasty shoc This happened about 3 days after I had used th capacitors. Tell me, how long do condensers ge erally hold their charge in open air?"

It depends upon the size and type of condense However, I have known a 100 mf electrolytic cap citor to hold a very large part of its charge aft 60 days, my left hand will attest to this! In are where the humidity is high, there will be a ver gradual leak-off of the stored charge, but very muc faster than in a very dry atmosphere. Be safe, n sorry! Discharge those capacitors when you sto

nem. Also, when working on any power supply or ig containing condensers in high voltage circuits, ischarge them *before* making any tests. You not nly can blow an ohmmeter but you can also "cook" finger or hand. In real high power circuits you an be knocked head over heels—sometimes fatally . . yes, by the stored charge in a capacitor! !

Fan Dirt—"Is not dirt pulled in by an unfiltered fan) air source, worse than no cooling at all?"

Dirt is an enemy of electronic equipment; no oubt about this. But so is heat. When a fan is nstalled without a filter (especially if it blows air nto switch contacts, open coils etc.), affected parts nould be cleaned at least once every three months. hose of you who have Apache transmitters take eed! Remove the final cover after 6 months opera- on (especially if you smoke when operating) and heck the final coils and final switch contacts; you'll nd a lot of dust. I advocate moving the fan to the ear on the TX-1 and mount it on two rubberized and-offs. Between the fan and the final compart- ient place a piece of filter element (obtainable om most air conditioning sales outlets).

Tape—"Recommend a good electrical tape to me or outdoor use, will you? Where I live it is hot in ie summer, cold in the winter and we get our share f rain. You know what this does to tape!"

Try Bishop's Bi-seal self bonding, polyethylene ased electrical tape. It works on rubber, plastic nd metal. It has a dielectric strength of 20.000 olts; is a good moisture sealant and is resistant to cids and alkali. It does not come "unstuck" as some pes do because it "congeals" into one solid mass fter it is applied. Its terrific for outdoor work ound antennas, electrical wiring systems etc.

Transistor Oscillator—"Please publish a circuit a transistor audio oscillator which will give me a irly good 1000 cycle note. I plan to use it for s.s.b. ignment too if the distortion is down far enough."

See fig. 2. The values of the resistors may have to juggled a little to give you the "distortionless" iality you want. For me the circuit works well.

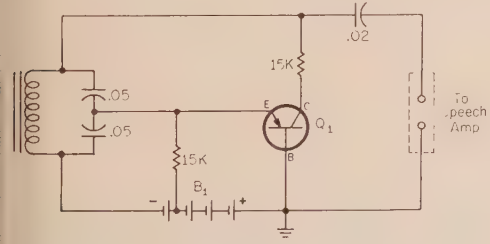


Fig. 2—Diagram of a simple transistorized 1000 cycle audio oscillator with fairly low distortion output. Battery B_1 consists of 4 Mallory ZM-9 mercury cells stacked and tapped as shown, while L_1 can be any 0.5 hy inductor, preferrably one of the Hi-Q torroids. Transistor Q_1 can be any good audio transistor such as the CK-722 or 2N1265.

2N278 Transistors—"I need some 2N278 ansistors for a power supply I'm building. Where n I obtain them?"

From your local Delco distributor or from TAB, 1 Liberty St., N. Y. 6, N. Y. at $5.00 each.

DX 100 Tip—Thanks to Frank, W6MNE, here's a tip on the DX 100.

Reports of AC hum got Frank to digging, and he found that his second hand DX 100 (wired by someone else) had some "short-cut" connections. The ground return from the cathode of the oscillator goes through the fone/c.w. switch, and on phone is grounded by the plate switch. As it should be wired (page 30, pictorial 6 in the instruction book) a wire goes from a ground lug on the plate switch and then back to pin 3 of the 6AQ5 clamp tube. This is the ground end of the filaments of this tube. A "short-cut" from pin #2 on the plate switch to pin #3 on the 6AQ5 to ground will result in hum.

You can see why the instruction book should be followed when building kits. A connection may look better with your "method" of connection but may introduce a condition you do not expect. Follow instructions and *do* check the wiring on second hand kit equipment.

Service Charges—"What do you consider fair service charges for repairing a receiver at the factory?"

Generally, $6.00 per hour is charged for a receiver with a minimum charge of $12.00, plus parts.

To maintain a well-equipped laboratory and/or service facility is not an inexpensive operation. These days it is not easy to obtain the services of experienced technicians. I feel that the various manufacturers who maintain service departments do charge properly and make very little profit from service operations.

Non-Technical Department

No Answer—"I have written one manufacturer five times about my malfunctioning transmitter and receive no replies. What should I do?"

Send HAM CLINIC your letter and we'll put you in touch with the boss of the outfit. Most manufacturers do answer correspondence quickly. However, they cannot be forced to answer letters that are not courteous. Are you sure that you directed your letters to the correct place? If your set is old the manufacturer may have gone out of business a long time ago . . . better check on this.

Thirty

I am looking forward to returning to the United States from France within the near future. Those of you who write HAM CLINIC please be patient, your letters will be answered in time.

To encourage those who would like to write for *CQ* but who feel that they may not have enough material for a full article, HAM CLINIC will throw open a portion of its pages to those who have short items. We'll call the guest writer's space, "A Ham Guest Speaks". Keep your material down to 1½ pages double spaced—type or hand written.

You may write on any subject related to ham radio, but the technical will be given preference. We'll edit your copy, so don't worry about grammar, composition etc. Send your piece in now! All items (used or not) will be acknowledged.

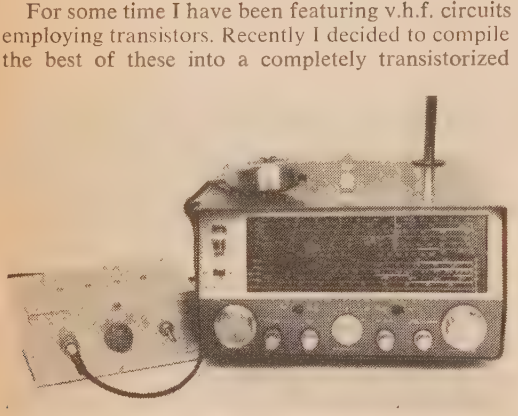
So HAM CLINIC wishes each and every reader a very happy New Year and will be looking for you on the air from W6QLV/?. Thank you for writing.

72, 73 and 75, Chuck

by DONALD L. STONER, W6T
P.O. Box 137, Ontario, Calif.

semiconductors

For some time I have been featuring v.h.f. circuits employing transistors. Recently I decided to compile the best of these into a completely transistorized two meter station. The primary objective was to construct equipment which would not employ transistors priced beyond the pocketbook of most amateurs. The Philco "T" series is used in the equipment and currently sell for about $3.00, or approximately the same as a 30 mc drift transistor. It is interesting to note that the devices used in the converter section have an f_{max} in excess of 500 mc. The transistor used in the r.f. amplifier has an f_{max} of 1300 mc. It will actually oscillate this high in frequency!

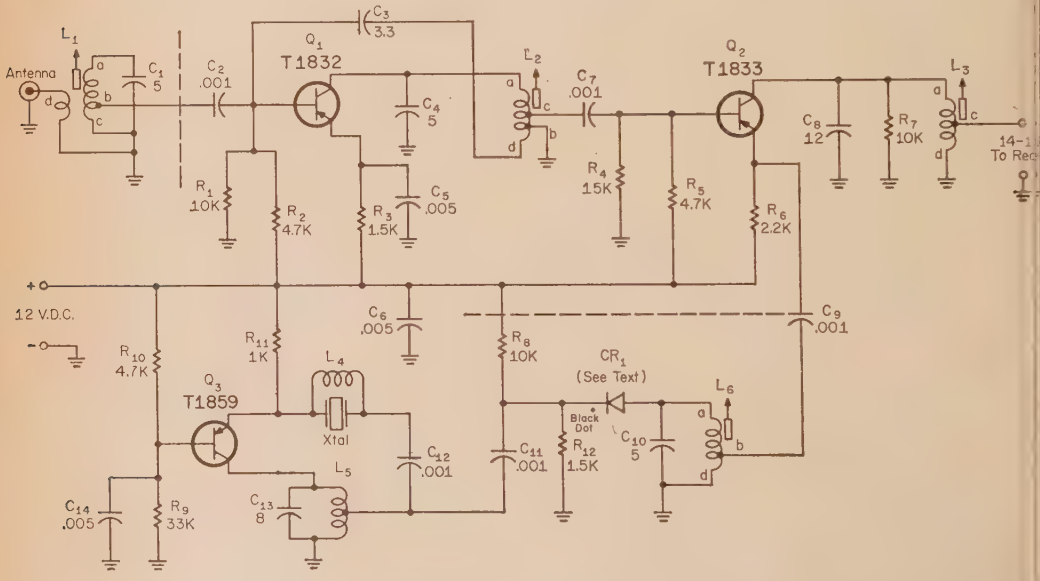


Overall view of the completely transistorized two meter station described herein.

The Converter

The schematic diagram for the converter shown in fig. 1. It a take-off on the device signed by Specialny, and described in the Aug 1960 issue of *CQ*[1]. The only modifications are

[1]Specialny, J., "A Transistorized Converter For 144 Mc. Band", *CQ* August, 1960, p. 40.



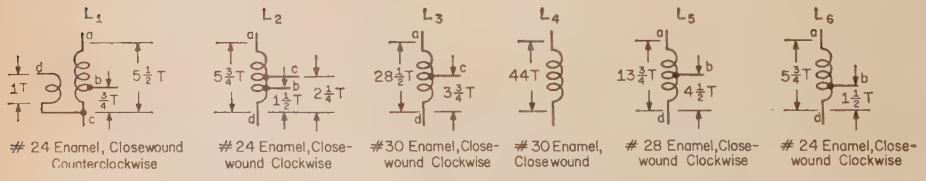


Fig. 1—Schematic diagram for the two meter converter. An International 43.333 mc third overtone crystal produces an i.f. of 14 to 18 mc. The diode Q_1 may be any inexpensive diode which exhibits the variable capacity effect (the more, the better) will work. A 1N60 is recommended, if a parametric diode is not available.

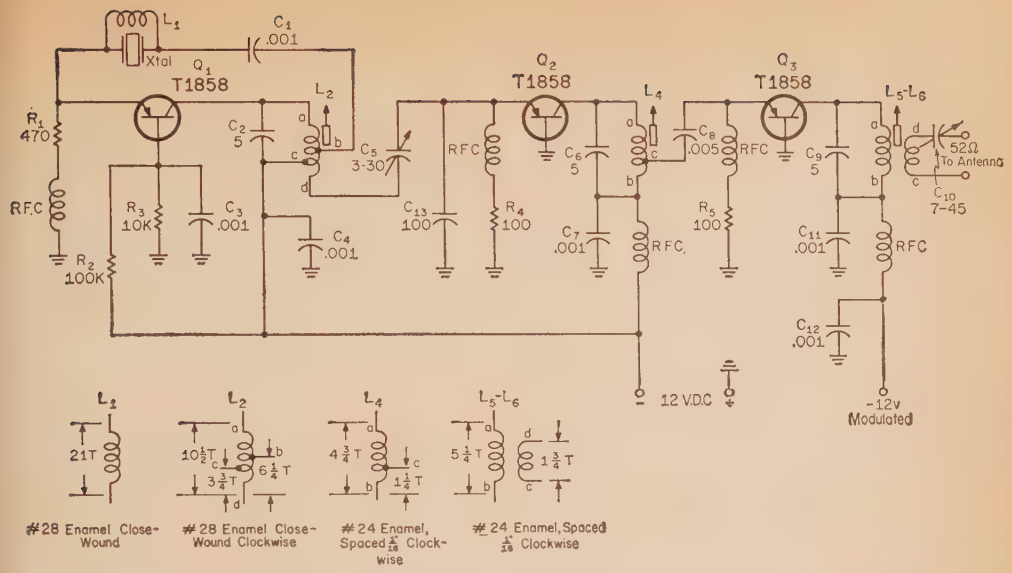


Fig. 2—The transmitter employs an International 72.02 mc fifth overtone crystal in a neutralized circuit. The transmitter is tuned up by measuring the voltage developed across R_4 and R_5, while tuning for maximum power output.

addition of a crystal controlled oscillator and harmonic generator, and the use of a later series of *cadmium* transistors with increased dissipation and f_{max} ratings.

The antenna is coupled to the input coil, L_1, through a one turn link. A tap on this same coil matches the impedance of the transistor base. The r.f. amplifier is connected in the common emitter configuration, and is neutralized to obtain the best possible noise figure. A voltage divider consisting of R_1 and R_2 biases the amplifier, while R_3 provides the necessary stabilization. This stage is capable of a 4.5 db noise figure and a power gain of approximately 20 db.

The amplified signal is coupled to the mixer through C_7. This stage is biased closer to the cutoff knee for proper mixer action by R_4 and R_5. The local oscillator signal is injected across the emitter resistor, R_6. The difference frequency, in the 14-18 mc range, is fed to the i.f. coil L_3 which is connected to the receiver.

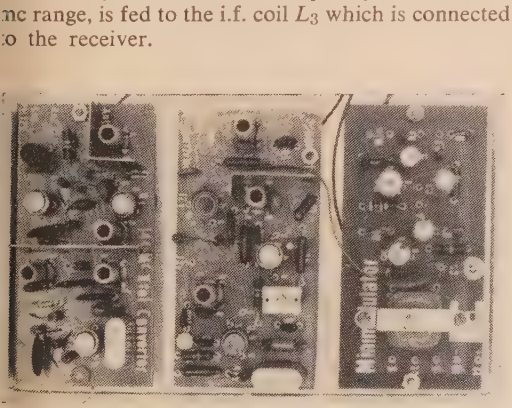


Photo of the three etched circuit boards comprising the modulator, converter and 2 m. transmitter.

The local oscillator signal is somewhat unusual in that it employs no more transistors than the original "free-running" circuit, and yet is crystal controlled. Transistor Q_3 is used as a third overtone generator operating on 43.333 mc. Energy which appears across the oscillator coil, L_5, is coupled back to the emitter through the crystal. Coil L_4 serves to neutralize the crystal, insuring that the stage will only oscillate at the third overtone frequency. The network R_{10} and R_9 provides the necessary forward bias and R_{11} stabilizes the stage.

Radio frequency energy at 43.3 mc is coupled to the harmonic generator diode, Q_4, through capacitor C_{11}. Note that the diode is back biased, that is, the anode is negative with respect to the cathode. Thus the junction represents a considerable amount of capacity. The r.f. signal switches the diode through its capacity range and into conduction, thereby clipping the r.f. signal. The clipping process produces a strong harmonic content and it is this third harmonic energy (130 mc) which appears across coil L_6, and is coupled to the mixer for injection.

The bandwidth of the converter is made approximately 4 mc by stagger tuning coils L_1, L_2, and L_3. Of course if you have a favorite spot in the band the coils can be peaked to favor this portion and provide almost 30 db of power gain. The converter is used in conjunction with a communications receiver covering 14 to 18 mc.

The Transmitter

The transmitter circuit is shown in fig. 2, and uses three similar Philco "T" series transistors. Transistor Q_1 is a fifth overtone oscillator (operating at 72.02 mc) connected in the common base configuration and is similar to the oscillator used in

the converter. The feedback path, to sustain oscillation, is from a tap on coil L_2 through capacitor C_1 and through the crystal. As before the circuit is neutralized to prevent undesired oscillations. If L_1 were not in the circuit, the r.f. energy would "see" the crystal plates as a capacitor and pass on through to the emitter. Thus the feedback, and subsequent oscillation, would occur at a frequency determined by L_2 and not the crystal. Coil L_1 is resonated approximately 5% higher than the overtone frequency of the crystal. At any frequency other than this the feedback energy "sees" a high impedance and a free-running oscillation cannot occur. More about the adjustment of this circuit later. Resistor R_1 serves to stabilize the stage, while R_2 and R_3 provide forward bias. A choke in series with R_1 raises the emitter impedance and prevents R_1 from absorbing some of the feedback energy. The portion of coil L_2 between points "c" and "d" serves as a link and not a part of the tuned circuit. Capacitor C_5 serves to adjust the drive to the buffer/doubler, and is a critical adjustment as will be pointed out later.

Transistor Q_2 serves to isolate the oscillator from the amplifier and operates as a frequency doubler. Bias for the stage is obtained from the positive half cycles of the r.f. drive. Each half cycle makes the base more negative than the emitter, causing conduction. Here again, clipping of the r.f. cycle generates a strong harmonic component which appears across coil L_4.

The final amplifier is almost identical with the buffer multiplier. Transistor Q_3 is also connected in the grounded base configuration, but of course, the input and output coils are resonated at the 144 mc signal frequency. Coil L_6 couples the r.f. energy to the transmission line and capacitor C_{10} tunes the link reactance out in addition to matching the link to the transmission line. R.f. chokes are used in several portions of the circuit, either to raise an impedance or prevent undesired r.f. feedback paths.

The Modulator

The modulator employs two transistors, as shown in fig. 3. Transistor Q_1 is used as an emitter follower to match the high impedance of crystal, ceramic or dynamic microphones to the low impedance of Q_2's base circuit. Resistor R_1 and C_1 in the mike circuit form an r.f. filter to prevent rectification and subsequent audio feedback. Bias for Q_1 is obtained at the junction of R_3 and R_4 and fed to the base through R_2. Resistor R_2 and C_3 also form a degeneration network to raise the input impedance at the lower frequencies.

Audio drive from capacitor C_4 is applied to the base of Q_2, the modulator transistor. Resistors R_5 and R_6 bias the stage and in conjunction with R_8 determine the operating point. The amplified audio appears across one-half of the modulation transformer, which is the secondary of a standard 10K to 2K transistor interstage transformer. The winding is connected in an auto-transformer configuration which provides an excellent impedance match and insures at least 100% modulation. No gain control is used since the modulation can be easily controlled by regulating the distance between mouth and mike.

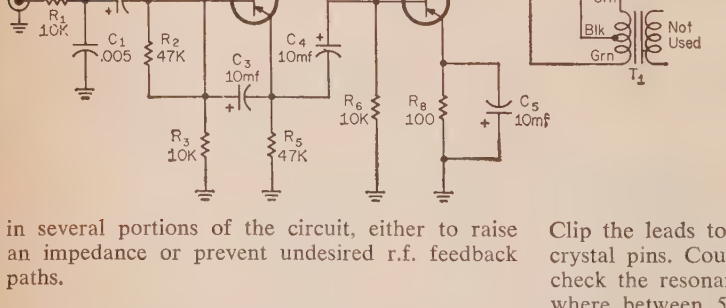


Fig. 3—For simplicity, no volume control is used in the mini-modulator circuit. Note that the modulation transformer (a standard transistor interstage transformer, secondary used only) is connected as an auto transformer. Transformer T_1 may be any 10K to 2K c.t. transistor interstage transformer.

Construction

The three units were constructed on etched circuit boards for compact construction and reproduction. It should be pointed out, however, that there is nothing "magic" in the epoxy boards and standard chassis construction can be employed, if desired. It may be necessary to prune the coils to compensate for additional lead length and strays, however. Figure 1 also shows the exact winding details for the coils. Note that they are all wound in the clockwise direction with the exception of L_1. It is necessary to specify the direction of winding to insure that the taps will breakout over the proper lug on the etched circuit coil form. No trouble should be encountered reproducing the coils with the instructions given. Coil L_4 deserves special mention, however. The inductance or exact number of turns is relatively unimportant. The turns given are correct for the International third overtone cuts but may not be right for other crystals. The exact number of turns should be determined as follows: Wind the coil as specified on a 1 watt, one megohm resistor. Clip the leads to 3/4" and solder directly to the crystal pins. Couple a grid dipper to coil L_4 and check the resonant frequency. It should be somewhere between 50 and 55 mc, or slightly higher than the actual third overtone frequency. If it is lower than this, remove one turn at a time until it resonates in the specified range. If it resonates too high, start all over and wind extra turns on the form to make it resonate below the correct frequency, then repeat the above process. Once the number of turns is correct, cement them in place and unsolder the leads from the crystal. Note that coils L_1, L_2, L_5, and L_6 are wound on

ceramic etched circuit coil forms, while L_3 is wound on a $\frac{5}{16}$" paper-base etched circuit coil form.

The construction technique employed in the transmitter is similar to the converter. The winding technique for the oscillator neutralization coil (L_1) is similar to that just described for the converter. Coil L_1 resonates at 78-83 mc or just slightly higher than the fifth overtone frequency of 72.02 mc. The drive control capacitor is attached to the circuit board by soldering stiff wire leads to the lugs and soldering the leads to the board.

The modulator is constructed on a XXXP etched circuit board and there are no particular precautions involved in wiring this unit. On this board, as on the others, many of the components "stand up" to conserve space. Transistor sockets can be used or not, as desired. It is permissible to solder the leads within $\frac{1}{2}$" of the case. Shields, made by soldering stiff wire to copper plates are used in the converter between L_1 and the remainder of the circuitry and between the local oscillator and the remainder of the circuitry. One shield is used in the transmitter to isolate coils L_4 and L_5.

Adjustments

Once the converter has been wired, connect a 0-10 ma meter in series with the plus lead. The total current will be approximately 7 ma. The correct method of checking the current of each stage is to measure the emitter voltage which is developed across the emitter stabilization resistor. The voltage across R_3 should be approximately 3.7 volts, indicating an emitter current of slightly over 2 ma. A measurement will show about 2.0 volts developed across R_6, which would indicate a current of something less than one ma. Last, but not least, the oscillator develops 1.0 volts across the 1K emitter resistor (R_{11}) indicating a current of one ma. The difference between the total and individual currents is accounted for in the three voltage dividers which supply bias to each stage and the parametric up-frequency diode.

Align the converter in the following manner: Disconnect capacitor C_9 from coil L_6. Couple a grid dipper to coil L_5 and adjust for maximum r.f. consistent with stable operation. The oscillator should start immediately when power is applied to the circuit. Next, wind a two turn link around the grid dipper coil and a two turn link around L_6 and connect the two. Adjust L_6 and touch up L_5 for maximum r.f. energy. Don't expect the dipper to read too high; probably one tenth of the scale is normal, but more than adequate for proper injection. Reconnect capacitor C_9 and connect the converter to an antenna and receiver. Peak coils L_1, L_2, and L_3 for maximum signal, then stagger slightly to cover the portion of the band desired.

The transmitter adjustment is also quite straightforward. There are two important considerations, however, regarding the transistor ratings. MADT transistors are characterized by the fact that their bases can be overdriven and this power must also be dissipated. The specification sheet specifies a maximum of 0.5 volts between emitter and base and a maximum dissipation of 60 mw for the T1858's used in the transmitter. By measuring the voltage across the 100 ohm emitter resistors it is possible to check the two specifications at the same time. For example the voltage across might read 0.3 volts, which is within the first specification. It also tells us that the stage emitter current is 3 ma (0.3 volts divided by 100). Multiplying the current (in ma, not amperes) by the collector voltage determines the power input. In this case 3 ma times 12 volts equals 36 milliwatts, which is also within the transistor ratings. The voltage across R_5 may rise to 0.5 volts, which indicates an emitter current of 5 ma which also comes out at the rated dissipation (5 ma times 12 volts equals 60 milliwatts).

Transmitter Adjustments

Adjust the transmitter in the following manner: Tune coil L_2 for maximum r.f. power, consistent with stable operation, as indicated by the voltage developed across R_4. Keep in mind that the voltage across this resistor, and R_5, should never exceed 0.5 volts. Next, couple the grid dipper to coil L_4. Tune L_4, and touch up C_5 (the drive control) and L_2 for maximum power output. Finally couple the grid dipper to L_5 and tune the preceding components (L_2, L_4 and C_5) for maximum power output consistent with the transistor ratings.

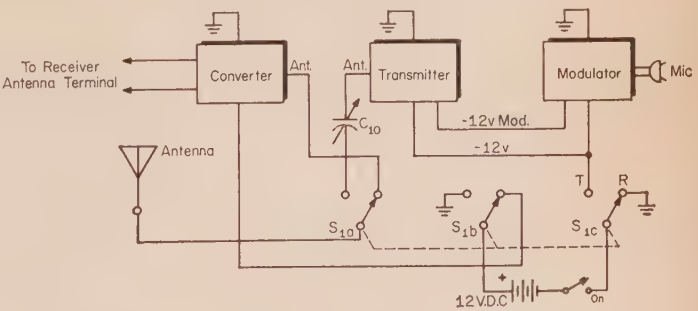


Fig. 4—Voltage distribution for the transistorized two meter station. The battery polarity change accomplished by S_{1b} and S_{1c} is described in the text.

There are no adjustments, or any particular set-up procedure, in the modulator section. The three units should be interconnected as shown in fig. 4. A three pole, double throw switch is used to switch the battery and antenna. The unusual power connections resulted from a converter design which had a positive ground and a transmitter with a negative ground. Thus the battery must be "flopped over," as shown, by the T-R switch. No metering is provided, for once the transmitter is set up, the adjustments are not likely to change. The antenna loading will not cause the output transistor to exceed its ratings.

International's tube replacement type high voltage silicon rectifiers. (Courtesy of International Rectifier Corp.)

Transistor News

Arnold Magnetic Corporation, 6050 W. Jefferson Blvd., Los Angeles, is producing a wide line of transistor power converters and inverters. The catalog sheet of solid state power supplies lists almost 100 types.

Bendix Corporation, Red Bank Div., Holmdel, New Jersey, is coming to the front in the power transistor sweepstakes with their new 2N1651-53 series, rated at 25 amperes and 100 watts dissipation! A pair of these units are capable of switching 1600 watts. A smaller version, the 2N1073, A, B, is rated at 10 amperes and 60 watts of dissipation and is capable of switching up to 1200 watts. These transistors have an alpha cutoff of 1.5 mc, making them useful in r.f. and core driver applications.

CBS Electronics, Danvers, Mass., is now supplying sample microcircuit decks, as shown in the accompanying photographs. Designed as a universal logic module, the basic microdeck can be used for a variety of logic functions by appropriate connections of the various active and passive elements. CBS has also announced a new series of power transistors capable of dissipating 85 watts. The units, built in the industrial package (similar to Delco) are designated types 2N173, 2N174, 2N277, 2N278, 2N441, 2N442, 2N443, 2N1099, and 2N1100. Collector-base voltages, V_{cbo}, as high as 100 volts are available at extremely attractive prices.

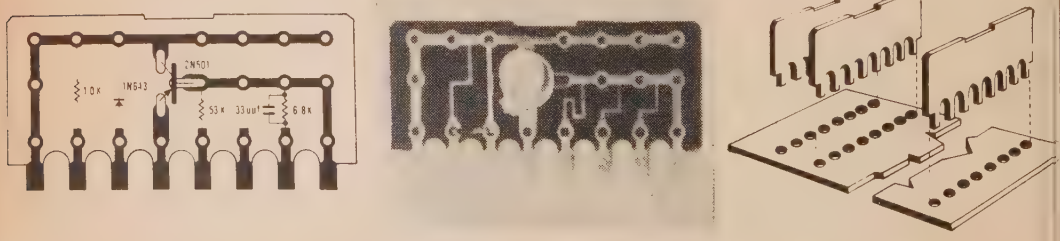
International Rectifier Corporation, El Segundo, Calif., have a new series of silicon plug-in rectifiers to replace tubes such as the 6X4, 12X4, 0Z4 and 6X5. Their ST-8 (7 pin) is rated at 1250 volts p.i.v. while the 8 pin replacement (1N570) is rated at 1500 volts. Also new from International is a miniature hermetically sealed silicon zener reference element, their type number 1N429. This 6.2 volt regulator is capable of stability of $\pm$ 1% over the temperature range of $-55°C$ to $+ 100°C$. The unit is rated at 200 mw dissipation and has 20 ohms impedance at 7.5 ma.

PSI, Pacific Semiconductors Inc., Hawthorne, California, have filled in their exotic range of transistors with a new device, the PT530. The triple diffused mesa transistor is described as a medium power v.h.f. communications transistor and is capable of a power output of 5 watts at 30 mc. The collector voltage is 28 volts and it has a power gain of 10 db minimum. Currently the price, in evaluation quantities, exceeds $100, but within one year the price in single quantities should drop to $10 $20. PSI also has a series of amazing Micro Mesa diodes with reverse recovery as fast as 2 nanoseconds and 2 picofarad junction capacity. The IN90 through 1N916 are priced between $2.50 and $6.0

Sylvania Electric Products is marketing a new epitaxial mesa transistor. The SYL2300 is equivalent to the 2N705 while the SYL2301 is interchangable with the 2N711. Epitaxial is derived from the Greek word meaning "settling on." Thin semiconductor layers are epitaxially deposited on low resistivity substrates, or bases, of germanium. Such devices combine the high reliability, switching speeds, and high power dissipation of the mesa transistor with the low saturation resistance of high frequency alloy types. Sylvania also has announced a high speed germanium alloy switching transistor type 2N1605A, as a companion to the 2N404A. The new unit is priced at $2.44 in single quantities.

So much for semiconductors this month. The next column will feature a completely transistorized six meter station designed along the lines of this month's two meter gear 'Til then . . .

73, de Don, W6TNS



CBS Electronics universal microdeck showing the typical schematic and method of stacking.

CQ World Wide V.H.F. Contest

Hold onto your hat, because here comes the *CQ* World-Wide V.H.F. Contest promising to go down in history as the biggest and best ever.

When: From 8:00 P.M. *local* standard time, Saturday, February 25, 1961 until 8:00 P.M. *local* standard time, Sunday, February 26.

Where: Any v.h.f. band 50 mc or higher.

How: Here are the complete contest rules.

Single Band Operation

1. Operation on any one of the v.h.f. bands may be considered for an award.

2. Contest contacts must include the following exchange of information: county, (section) and state (or country), signal reports, contact number and handle. *Two way acknowledgment of information must be made.* Contacts shall be numbered consecutively beginning with 1.

3. In the U.S.A. or Canada, sections shall be considered as the counties in which the stations are located. In other countries, equivalent political subdivisions shall count as sections.

4. Contacts with mobile stations count the same as all other contacts. However, contest logs from mobile stations cannot be accepted for award consideration due to the difficulty in determining the section category of the mobile station.

5. Scoring is as follows:

a) Each completed contact scores two (2) points. Uncompleted contacts do not count.

b) A multiplier of one (1) is received for each new section worked.

c) A multiplier of one (1) is received for each operating hour in which at least one contact is made. (Maximum of 24).

d) A power multiplier of ten (10) is granted for final power inputs from 0 to 25 watts, a multiplier of five (5) for inputs from 26 to 75 watts, a multiplier of three (3) for inputs from 76 to 150 watts and a multiplier of one (1) for inputs from 151 to 1000 watts.

If, for example, you were to work 110 stations in 25 different counties, running 50 watts and operating a total of ten hours, your score would be computed as follows:

110 (contacts) $\times$ 2 $\times$ 25 (sections) $\times$ 10 (hours) $\times$ 5 (power multiplier) = 275,000 points

6. Awards will be made to the highest scoring stations on each individual v.h.f. band in every state, province and foreign country from which at least three logs are received. A special gold plaque will be awarded to stations submitting scores in excess of three (3) million points.

Multiband Operation

Rules for multiband entries are similar to those for single band entries with the exception that no power or hours multipliers shall be given. Awards will be made to the highest scoring multiband station in every state, province or country.

Logs

a) Logs should be complete in every detail and should prominently display the itemized resultant score. The log should be accompanied by a cover sheet on which the total score, name, address, call and state of the operator(s) should be clearly indicated.

b) Logs should be postmarked no later than March 15, 1961 in order to be considered for awards. Results will appear in July *CQ*. All logs should be mailed to:

Log Department
V.h.f. Editor—*CQ*
67 Russell Avenue
Rahway, New Jersey, U.S.A.

VHF

50mc. 144mc. 220mc. 420mc. and above

BOB BROWN, K2ZSQ
67 RUSSELL AVENUE
RAHWAY, NEW JERSEY

Well, here it is! Another year of v.h.f. ahead of us with records to break and contests to top . . . And speaking of contests, the big news this month is the coming *CQ* World Wide VHF Contest on the week-end of February 25 and 26, 1961. Full details appear elsewhere on a separate page devoted to filling you in on how to win without getting your score a bit confused. Get the gear ready, get your club v.h.f. group together, for the most superb, collosal, tremendous, gigantic, outstanding, extraordinary, amazing, magnificent, stupendous and darned best v.h.f. contest ever!

Bootleg Station?

Just received a very interesting bit of news from M.Sgt. Earl W. Freiberg, KL7BLQ, of the Hq. Alaskan Air Command. To quote him, "The call signs KL7FLA through KL7FLE have been given by the FCC to Chief MARS Alaskan Air Command for issue to ice islands. At the present time the only legal call is KL7FLB Driftstation Bravo (T3). Ice Floe (Driftstation) Charlie has been abandon for over 6 months. *Therefore, if KL7FLC was heard in August, it was an illegal call.* If, at any time FLC is heard again we would like to know about it and would like to have the name of the chief operator if possible.

"Of course I am (as well as A.A.C. Chief of MARS) interested in running down bootleg stations. I am the Frequency Allocation man and Interference man for the Alaskan Air Command. So, part of my job is to stop bootleg stations."

England—Two Meter Aurora

George Jacobs, W3ASK, our very able Propagation Editor, sent along the following note which he received from an SWL friend in Selsey, Sussex, England . . .

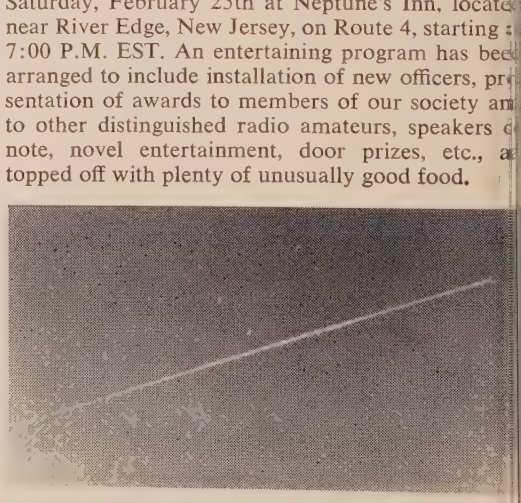
"Thought I would advise that we had a terrific aurora opening which began at 10:35 P.M. GMT October 6 and was still reflecting signals when I fell asleep at the table approximately 12:48 A.M. October 7—the band of course was 2 meters.

"I copied CQ's or QRZ's from ON4CP, DL1RX, SP3GZ, HB9RG, PAØFB, OK1VDM, DM3ENA, and DJ3OY. About 20 hams from Scotland, several in Wales and one in Ireland. The band sure wa busy with the a.c. notes, chirps, and cheeps, an what-have-you.

"WWV was just about completely out at 7:3 P.M. October 6. Just managed to get the last innin of the World Series." *Many thanks, Bill, for this in formation, and to you, George, for sending it alon to us.*

Hamfests

January 14 and 15: Tropical Hamboree of 196 At the Bayfront Park Convention Auditorium, 5th Biscayne Boulevard, Miami, Florida. This annua event is sponsored by the Dade Radio Club, In They're having a special drawing for those registe ing at the v.h.f. table: Finco 6 & 2 meter bea ($33.00). Hamboree registration; $1.00. Ticke may be obtained from members of the Dade Radi Club, local ham distributors, or by writing P.O Box 104, Miami 1, Florida. Banquet tickets $5.00 **February 25:** The East Coast V.H.F. Society, Inc will again entertain its members and many friend at their 3rd Annual Dinner and Hamfest to be hel Saturday, February 25th at Neptune's Inn, locate near River Edge, New Jersey, on Route 4, starting 7:00 P.M. EST. An entertaining program has bee arranged to include installation of new officers, pr sentation of awards to members of our society an to other distinguished radio amateurs, speakers o note, novel entertainment, door prizes, etc., a topped off with plenty of unusually good food.



Here's a shot of Echo I over Rahway during the peak of amateur participation on August 25, 1960 at 9:55 P.M. EDST.

The GARNET, a New Jersey 2 meter communication net, celebrates at a banquet recently.

Tickets are priced at $5.00 per person and are available from any member of the society, or by writing Roy King, K2BNQ, 55 Woodland Avenue, Montvale, New Jersey. Tickets will also be available from many of the better known radio parts distributors in the East Coast area. Ticket deadline is Sunday, February 12th and no tickets will be sold at the door. Motel accommodations are available nearby for out-of-town visitors.

Editor's Comment: Make it a point to be there at River Edge this year! I will be there, as every year, and would like very much to see a big turnout . . . Last year there were over 600! See you at River Edge!

DX vs. rag-chew

On any band there will always be the DX vs. rag-chew controversies. This month I received a few letters emphasizing the latter, representing local work rather than record breaking DX hauls. Most were too long to reprint here, but we thought we'd present these views for your analysis . . .

Cal Hadlock, W1CTW/W1IQD, of Arlington, Massachusetts, writes that he feels there are many fellows who are very happy to have a pleasant leisurely QSO across in preference to snagging DX. To quote, "I remember only too well the dead six meter band we had before the arrival of the Technicians." He continues to mention the fact that he and others in the Boston area have called CQ many times only to find a "dead" band. But just wait until the W9's start rolling in, and they're *all* in there calling him frantically.

Cal has a good point, I think. DX'ing, as well as the other aspects of v.h.f. work, can be carried to extremes. We must try to avoid this as much as possible if we want to achieve our potential.

Unused Top Megacycles

Another letter, this one from **Warren Middleton, W4DYE, of Lynchburg, Virginia,** concerns the furthering of activity above the middle half of both 6 and 2 meters. Warren mentions the existing FM networks all over the country that employ the frequencies around 145 and 147 mc and 52.525 mc for their channel-type operations. He feels that there is quite a bit of activity going on in the "unused" top megs of each band that is almost never brought to light. In fact, his local FM net is now publishing a second edition of a complete v.h.f. f.m. directory. If you're interested in this listing, why not drop him a line at 1223 Fenwick Drive, Lynchburg, Va., for a copy?

Warren also mentioned that he'll send along for inclusion in this column further info on FM nets, equipment, activities, technical and licensing problems of mountain top radio controlled stations (for remote control), and the like. Sure would appreciate the dope!

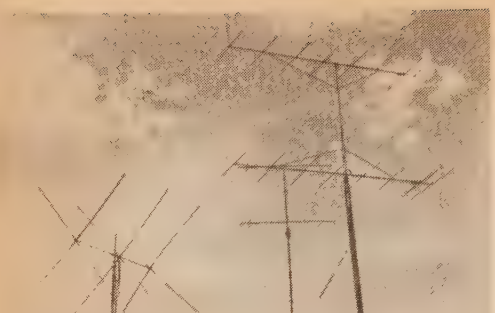
ZS1—W2 on 6 Meters?

In our monthly correspondence with LU3DCA, Mike brought up the fact that ZS1LA received a heard-report of his 6 meter signals (while in contact with some other ZS1) from K2POQ and K2AZ in New Jersey. "It is a very interesting point," Mike mentions, "as this would be the first time the signal of a ZS1 has been heard in the U.S.A." This, of course, intrigues us no end. Imagine! We are now in the process of checking out this report for its authenticity. Will let you know as soon as we have confirmation.

Century Club Awards

Our new CCC certificates are real beauts and we know you'll like 'em! As soon as we can have them photographed, we'll print them in this column. If you missed the details on this award, which is open to all enthusiasts on the four major v.h.f. bands, by all means check the November '60 *CQ* (VHF COLUMN, naturally) for all the info. You'd never believe the mail we've been getting as a result of these new awards! Larry, K2BVC, was the first to apply for the 220 mc certificate. Congratulations! Every day the mailman brings us another big batch of cards and letters. As you know, the lists are all that are required, but we've been getting bundles of cards, too . . . Those actually submitting cards themselves, will get a special endorsement. Be *sure* to include sufficient postage for their return, as we've just about gone broke with those daily trips to the Post Office—hi!

Underside of the crystal controlled converter for 432 mc in use at LU3DCA.



KP4CK's antenna farm in Puerto Rico. On the left we see the 20-15-10 meter quads, in the center his 144 mc stacked arrays, and on the right the 50 mc Yagis.

South American Report

Our friend **Michael Cyzsch, LU3DCA, of Buenos Aires, Argentina,** comes through in a big way this month with some doings from down his way . . .

"On October 7 the band opened up in the morning hours (6 meters). After hearing the commercials from Venezuela for awhile, K8ACC came in calling CQ and a QSO was established at once with Andy. Five minutes later I heard KØREE in Kansas and K9KZB/mobile in Illinois calling, so I first answered the latter and got my 30th state on the way to Worked All States! During the following hours some W6's were heard weakly, then some W5's also there in the noise level, and only KP4ASH was on in Puerto Rico and putting in a nice signal. Then the band opened up to the Pacific, but it was not before 2030 GMT that I actually got another QSO, now with W4EQR in Florida, followed by W5FRK and K5RTR in Texas, K7ALE and K7ALF in Arizona, K6GRJ mobile in California, two other stations from Phoenix, Arizona, W5ARL in Louisiana and a WA6 again in California. All this time XE1DDD was also coming in and was contacted now when the stations from the U.S. had faded out. As if this weren't enough, in the late evening there was some T-E propagation but only PJ2AN was heard calling on c.w.

But not only in LU-land were we working DX. HC1FS reported working into W8 and W4, and most important, *the reception of JA2GR on c.w.!* This was the first time a JA had been heard in Equador, and, needless to say, Fred spent the rest of the day calling and listening in that direction but without further results.

"Since then we've continued enjoying our nightly T.E. openings, talking to our many friends in Puerto Rico (I have already worked 36 different KP4's and received the WPR-25 certificate after presenting 25 QSL's) and the Carribean countries and looking out for new ones, hi! And a new one did show up at 0308 on October 13; it was W7FKQ/maritime mobile on a ship off the cost of Guatemala, running a Gonset Communicator and a ground plane. On the following night he was contacted again by several of the local gang, showing again that you don need high power to work six meter DX if you ar in Central America."—*Many thanks, Mike, for a the info. Sure nice hearing from you again, an congratulations on getting that 30th state. There ar an awful lot of us here in the U.S. who haven't y gotten 30! Keep up the good work, and let us kno how you make out.*

6 Meter QSO Roundup

The contest announced last month is still goin strong, and the gang over at Clegg Laboratori have some real nice prizes lined up for the wi ners. It's still not too late to enter, you know. Dro a QSL card to: Clegg Laboratories Radio Clu Box 641, Morristown, New Jersey, and ask for set of rules and regulations and some log form Then take a tune across the 6 meter band and joi in the fun. Results will appear as soon as we g 'em—hope you're among the winners!

Two Meters—W4LTU

Walt Bain, W4LTU, comes in this month with two meter report . . .

"September 20 saw a good inland tropo openi present with W8KAY in Akron hearing WØIFS Minneapolis S9 on phone. WØYSJ in Fargo, Nort Dakota was heard by W8KAY and VE3DI Toronto, a distance of about 850 miles. Unfort nately, nothing from this opening was heard W4LTU although the frequencies of the DX st tions were checked carefully.

"On September 25 a coastal opening was beg ning to develop with W4AIB in South Caroli being worked on c.w. by W4LTU. On the 26th had developed fully and W4AIB and K4YUX, a S.C., were worked on 'phone with excellent signa W4RMU in Florida was worked on c.w. by W4LT but with some difficulty as W4RMU was hear

"Doc" Miller's (KØOKP) hombrew quad in Denver.

ostly W1's and W2's. Some W8's were heard at 4LTU but nothing was apparent from W9.

"October 4 showed some aurora on 144 mc, but ily W1's and W2's were audible at W4LTU. ctober 5 was a little better with a few W8's in dition to W1, W2, W3 and VE2. All this was just warm up for what was to happen on October 6, wever. To summarize the night of October 6 as gged here, 25 states in 8 call areas were heard, cluding such goodies as S.C., Ga., Ala., Miss., k., Mo., Iowa, and the rarest of rare, Louisiana. l of the southern states peaked up with the beam most due west, which shows the virtue of keeping e antenna moving during a big aurora. Report om New Jersey indicates that many of the signals aked from somewhat south of due west! As far geographical extent is concerned, this opening is ie of the best yet and certainly on a par with the g one last March 31."

More Two Meters—W4LNG

Ruddy, W4LNG, sent along a copy of a letter mailed to Jack, W8PT, chock full of details on at big October 6 opening . . .

"On October 6, 0555—0605 regular sked, I ard only 1 or 2 very weak pings. Just before the ed I had checked WWV on 5 mc and found it to buzzing as much as during previous auroras, so was on the lookout during and after our sked for 4 mc buzz signals. After the sked I called a few Q's till 0623, but heard nil.

"When I got home from work, I checked WWV ain and heard them send W3 at 1650 EST. I never ard 144 mc buzz except when they send W2, but checked and began hearing signals immediately. I lled CQ W3YNM, K2GQI, then W3YNM again my regular 144.287 frequency. After getting no swers I decided to move down in frequency—I d poor luck on all previous openings, so I con- uded that there must be local QRM (phone) and ilure to tune up to 144.287. I tried 144.008 but y xtal seemed to drift too much, so I went to 4.118. This is normally right between two locals, t neither of them was on that night.

"I worked WØIHD in Missouri for state number at 1744, then W8QVK in Ohio at 1755. Heard 4GSH and called at 1807, but nothing doing with 9AAJ, K2GQI, W9UNN or W9AAG. Dallas ked me about the frequency, so I gave him the ory. I called W3YNM again, but he doesn't seem have a receiver. I heard him in and out for over 2 urs and don't remember him working too much. I lled W8GGH at 1859, but no luck. Then worked 9ACU and W4KDH. KDH was last contact at 55. Last sigs heard were W4MKJ about 2010. so heard and mostly called were W9EHX, 2CXY, W2AZL, W3SGA, and W9ZIS. I may have ard W5RCI (I usually hear him on buzz), but I n not sure. W8KAY's automatic signals were ard, but were weak.

"All signals peaked farther to the west of north an any previous buzz I have heard. The New rsey boys were as loud as anyone and peaked st as far to the west. Naturally I looked for you (W8PT) at all the places I knew of, but I didn't check with you on 144.017 frequency in time for the buzz. I am sure that I didn't hear anything on that frequency.

"The lowest signal heard was Walt, W2CXY, on 144.005. The highest was W9EHX on 144.382. I normally tune to the end of my bandspread at 144.4. Occasionally I tune up on 145.5, but have never heard anything there except our local 145.35 net. If I read about any Technicians with high power c.w. rigs, I will tune for them, but so far the activity seems concentrated at the low end. My chief complaints during buzz are the use of bugs at high speeds that just run together, and the non-uniform band tuning. On the good side, I really appreciate the boys telling me who to look for."

Left to right, Rae, VE3BPR, Ellen Taylor, and Walt "Falcon" Taylor, K2MLT, at Falcon's Lair.

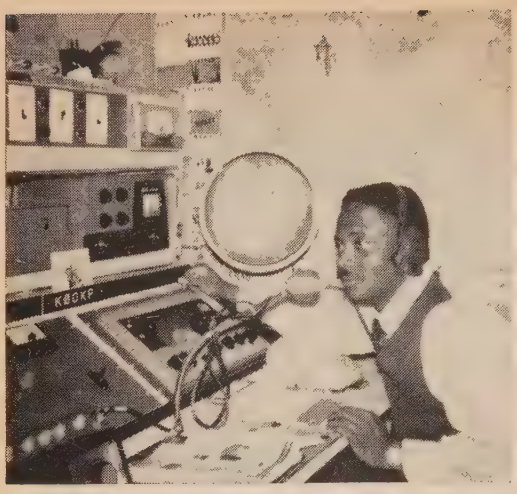
Mailbag

Memphis, Tennessee: Mike Usdan, K4PEV, gives us the 50 mc side of the story on that October 6 aurora . . .

"The aurora seems to have started off with a bang this season! On October 6, between 7:10 and 8:30 P.M., the band was full of stations between 50 and 51 mc. Down around 50.1 two sides of a c.w. QSO were copied 5-9-9 all the way between K9PNP and WØONL. Later on with the beam pointed to Kansas, WA2AOM was heard about 50.250 peaking S6-9. After that K4MBM's s.s.b. signal was heard bouncing off the aurora back to Memphis. Just below him HC1FS and LU4MR were battling the QRM each peaking 10 db over S9!"

Tulsa, Oklahoma: Jerry Reed, K5ZGV, adds his comments . . .

"Propagation has been picking up the last two weeks. We had a nice aurora (50 mc) on October 6. It started about 1750 CST and lasted 'till 2230. I worked Ohio, Michigan, South Dakota, Missouri, and Kansas. I also heard Nebraska and Colorado. Two days later on October 8, I heard the first F_2 of



KØOKP at his new s.s.b. v.h.f. set-up.

the season—HC1FS was in with 5-9 signals from 1300 CST to 1500 CST, but I couldn't raise him. I think he talked to every station in Texas! I hope this is a promise of things to come!

"The North East Oklahoma V.H.F. Society here in Tulsa is growing very nicely. We now have 20 members. We have started publishing a monthly newsletter, copy enclosed, and are formulating plans for several activities to further v.h.f. in this area. The NEOVHFS has also bid for and received the ARRL State convention for 1961 and is making big plans for it.

"I like your idea for setting up schedules in the column. I would like scatter schedules with anyone who would like to try. I am running a full gallon on s.s.b. and c.w. on both six and two." *Real fine, Jerry. Nice hearing from you. Thanks for the copy of* QSO, *your paper which you enclosed—A darned nice publication! Keep us posted!*

Dunbar, West Virginia: News of another net comes to us from Howie, K8SNW:

"Thought you might be interested in the following as news from West Virginia . . .

"As of October 15, 1960, an emergency net meeting each Wednesday evening at 2000 EST has been organized on 6 meters here and is called the Kanawha Valley emergency net. This net is affiliated with AREC and is strictly for emergency service drill practice.

"We have a membership of some 20 stations covering an area of about 50 miles radius from Charleston, West Virginia and for you fellows around your area who can get any traffic to us, we would be very happy to handle it.

"This net replaces the Mountaineer 6 Meter Phone Net that has been in practice for a couple of years." *Sounds like a real rip-roaring group, Howie. Let us know how it works out—Always glad to hear about your work.*

East Lansing, Michigan: Neil Kaltman, WA2-CNJ/8 (ex-K6SMF) writes us from the C QTH:

"Just thought I'd report a band opening occurred at 1055-1155 EST, on October 16, just like a pipe-line from central Michigan the heart of 5-land. We are at Michigan University in East Lansing running a Gonset municator II and a Halo out the 2nd story dorm window, and worked W5WUP, Clarksville, W5ARL, Shreveport, La., K5ZQY, Shreveport K5KKS, Hurst, Texas, and K5TKR in Arli Texas. Also heard but not worked were K5 K5KOU, K5RBN, K5OXX, and W5AJG, p or 40 other 5's we didn't log.

"Just thought *CQ's* readers might like to . . . We sure hope its not the last opening long, long time!"

Philadelphia, Pennsylvania: Ye olde v. himself, Bert, K3IUV, drops a "quickie" c u.h.f. work . . .

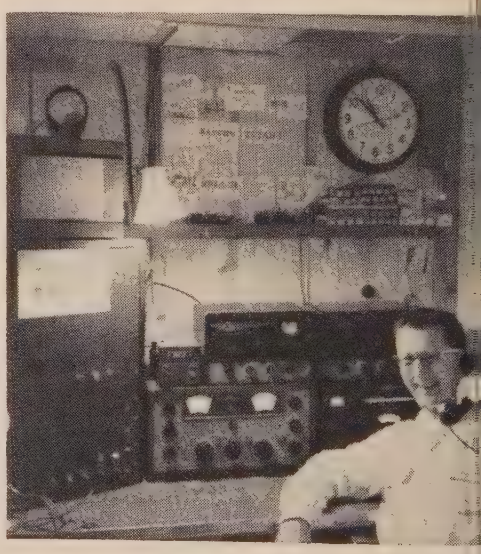
"I just got up 11 elements on 220 mc an copying all the local activity down in Philly." *gratulations!*

"Would like to see the frequency of 221.4 p as much as possible as the first mc of the 22 band is loaded with "birdies" from TV oscil

Denver, Colorado: This one comes from o cently appointed "V.H.F. Man Of The M "Doc" Miller, KØOKP . . .

"Since appearing in your column you see I completely changed my layout of the stat am still on a.m. with a Communicator II, but going s.s.b. v.h.f. very soon.

"I am presently on d.s.b. with a pair of 6 which is seen on the left of the enclosed p On top left almost hidden is the famous kw



John, KØDTA, at his Minneapolis, Minnesota, QT With this gear he's worked (and confirmed) 4 states on 50 mc!

ructed to operate s.s.b. on 50 mc, not yet com-eted." *Thanks for the briefs, Doc, and those autiful pix! Keep 'em coming!*

llicott City, Maryland: Gerry Bate, K3MWQ x K2MYQ) emits with . . .

"Hope to participate in the 6 meter contest but tivity down here is not what it is in the New rsey area. Eveyone seems to be afraid to use 6 eters in their homes, so 6 meter mobiles are quite ominent using vertical whips.

"Two meters is spotty . . . Everyone keeping an r to the band. Many nights I have tuned across e band and heard nothing and then go on with CQ and have had 3 or 4 stations come back to e. At least the gang is in there listening!

"During the month of August, I heard W2AZL, 2TTM, W2JG, K2BJP, K2GQJ, and numerous hers from New Jersey.

"I called all of them but could not make contact ith the Gonset II which was, and is, all I have ailable until I can get my 829B and xtal controlled nverter back on the air. All the equipment had be dismantled to move down here and I have t had time to get it put back together again. ttling the new home has taken all my time.

"The temporary 2 meter and 6 meter beam in-allation is only 20 feet up. Hope to have the 50 ot tower up with the big beams on it by Christ-as time.

"Please give my regards to the gang and I hope be set up to make some contacts up that way on on 2 and 6 meters as well as 220 mc (the latter mid-summer of '61)."

arissa, Illinois: Bob Heil, K9EID, writes . . .

"Very happy to see the new v.h.f. articles in *CQ*! you need any info regarding any type of 6 or 2 eter activity from the mid-west, don't hesitate king." *OK! How about some info from your area?* "Well, I am a C.E. 20A to a homebrew mixer iving a Gonset III linear or a Johnson 6N2 nunderbolt on s.s.b." *Fast service, eh?* "The anten-is a Telrex 11 element 6 meter *Spiralray* 90 feet and a 24 element collinear at 105 feet on 2 eters. Receiver is an NC-300 with Filter-King nverters on both bands.

"Been having skeds with K4RLX and K4OCK s.s.b. *(50 mc?)* November 6 at 0140, on schedule, rked Jack, K4OCK, at Miami with the band ad. I operate at 50.11 on s.s.b. and am always from 0130 to 0300 and from 0930 to 1200 any y. Would be very interested in skeds.

"Will send pictures of the rig if you like." *All ntributions gratefully accepted.* "If you could ention in the column about the skeds from here s.s.b. maybe things will happen—hi!" *You just d, Bob. Keep the info streaming in . . . Always ve use for it.*

llas, Texas: From the deep, deep South come me news from Al Corbin, W5KXD . . .

"I'm just getting started here on 144 and 220 *mc* anks to W2AZL, his fine converter, and to such fellas in these parts as W5AJG and W5RCI. Rig here is a pair of 4-125A's, 417A converter, and a 10 over 10 at 60 feet for 144 *mc*.

"Being a newcomer, I would sure appreciate getting the results of your research on propagational effects on the v.h.f. bands and any additional dope you wish to send on scatter." *Hold your breath, Al, 'cause the next few issues will have just what your looking for!*

"If you know of any of the fellows interested in scatter skeds with this part of the country, please let me know. I'll be in good shape for 3 or 4 early morning skeds a week, after the first of the year." *OK, fellows, let's lend Al a hand, eh? The QTH is A. J. Corbin, W5KXD, 6511 Aberdeen Street, Dallas 30, Texas.*

Sycamore, Illinois: Here's one from Ed Grey, K9SLM, that gets right to the point . . .

"We need publicity!" *See what I mean?* "A mention in the column would greatly be appreciated. The Kishawaukee Radio Club meets the second Monday of each month at the DeKalb High School, DeKalb, Illinois. Those who wish to write may contact me at Evergreen Park, Route 64, Sycamore, Ill. We are forming a v.h.f. group, too. All bands are in operation throughout the club members individual shacks, including many avid v.h.f. enthusiasts." *Keep us posted, Ed, as membership grows.*

Duarte, California: The land of the palms and nice weather is represented this month by Fred Handy, WA6UOV . . .

"On Friday morning (*This was dated* 10/10/60 *—ED.)* at 0645 PST I heard LU3DCA and LU1BJ with signal strength of 5-5.

"Made contact with LU3DCA at 0655 PST but he faded out before I could return his transmissions. At lunch time Michael was coming in 5-7 and another station also, but he had such a hum on his carrier that I couldn't be sure who the other fellow was. Between 1200 and 1330 PST I heard LU3DCA working into W4-5-6-7 lands but I again couldn't contact him.

"Michael sure had himself a field day, though! As I had my beam toward South America. I heard W5SFW say his beam was north-east and calling a WØ . . . But I rotated the beam toward Amarillo and could not hear Phil. Maybe next time?"

Thirty

We've received quite a bit of comments about the Mike Pre-amp in the November column from some of the gang who've had very good results with it and got a phone call from Jack, K2HHS, mentioning that it had been circulated in Northern New Jersey and had been forwarded to me for a wider distribution. Jack didn't design the circuit, but he's sure had a lot of fun with it.

Let's keep the news, photo's, comments, etc., coming in regularly! How about hearing from *you* next month? 'Till then . . .

73, Bob, K2ZSQ

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2
12 Elm Street, Lynbrook, New York

SSB DX HONOR ROLL

T12HP	219	W5KFT	151
W6UOU	216	W5RHW	150
W4IYC	214	K2HEA	150
VQ4ERR	212	KØCTL	150
W8PQQ	206	K8RTW	138
W6PXH	195	W6YMV	130
PY4TK	195	W6VUW	130
W7VEU	191	W2YBO	130
WØQVZ	190	DL4AS	128
K2MGE	188	W2NUT	125
HB9TL	186	W8ACT	124
W6WNE	182	W2ATJ	121
W6RKP	181	W7DLR	121
K9EAB	181	K6MLS	120
TG9AD	176	W6UPP	120
MP4BBW	174	W4UWC	119
W2LV	174	W1JSS	118
WØCVU	170	ZL3AB	117
W3MAC	165	K1IXG	115
W5IYU	165	W9ROU	114
K2FW	160	K2TDI	114
W1OOS	155	W3GHD	113
W4OPM	153	YV5AFF	103
K4TJL	152	G2BVN	102
W2FXN	151	W3HQO	101

W7DLR Offers Anniversary Trophy For Top U.S. S.S.B. DX Contest Operator

With great pleasure, we announce the addition of another trophy to be awarded following the *CQ* World-Wide S.S.B. Contest on January 28-29, 1961. In celebration of his 40th year in amateur radio, Jack Wilson, W7DLR, of Gresham, Oregon, will furnish a trophy, "The W7DLR 40th Anniversary S.S.B. Trophy" to be awarded to the highest scoring U.S.A. station in the Fifth Annual *CQ* World-Wide S.S.B. Contest. Jack hopes that this award will provide greater incentive for the W/K stations in this contest and more recognition for their increased sideband activity. In addition to being awarded for the highest W/K score, the trophy also carries with it recognition for "good, clean sportsmanship"—this is stressed by Jack in making this presentation! We want to thank Jack for his generous offer of this trophy and also congratulate him on his long career in ham radio with sincere hopes that he will enjoy still another 40 years of being a ham.

To those of you who may have missed previous mentions of this most enjoyable of all S.S.B. DX contests, the Contest starts at 1500 GMT, Saturday, January 28, 1961 and ends at 2100 GMT, Sunday, January 29. This is a 30 hour span but only 24 hours of operating will be permitted with the 6 hour rest period to be taken at one time. The object of the contest is to work as many stations and as many different prefixes on single sideband as possible. The number of stations worked, ti plied by the different prefixes is your final Want log sheets or complete contest rules? S *large*, self-addressed, double stamped envelo *CQ* Sideband Editors, 12 Elm Street, Lynb New York, and be prepared to have the ti your life on sideband!

QSL Verification Stations For Afric

We are very pleased to announce the addit two more stations to the list of those wh check out the confirmations of DX stations ing the "Worked 100" and "Worked 200" *CQ* Certificates. Attie, ZS6AMV, (A.J. Lou Wargrave Ave., Auckland Park, Johannesburg South Africa) has kindly volunteered to cards for stations in the following call areas ZS2, ZS3, ZS4, ZS5, ZS6, ZS7, ZS8, ZS9, ZE ZD6, CR6, and CR7. These encompass the " tries" of the Union of South Africa, Sou Africa, Bechuanland, Basutoland, Northern desia, Southern Rhodesia, Mozambique, an gola. All sideband stations in these areas wish apply for the "Worked 100" and "Worked certificates are to send their cards with an betized listing and return postage to Attie, Z

Bob, VK3SK, with XYL, Alys, during their 1960 v to the States (Photo courtesy of W2EEQ).

V. He will then verify their cards and forward lists to us for the issuance of certificates.

All other sideband stations in Africa wishing se certificates may send their cards for verifica- n to "Awards Manager," R.S.E.A., QSL Bureau, x 30077, Nairobi, Kenya. Thanks to the good ces of Robby, VQ4ERR, the "Awards Man- r" in Kenya will check out the cards for side- nders in the African countries not mentioned ve under Attie's supervision.

Cards need be submitted to ZS6AMV or the S.E.A. Awards Manager *only* for the "Worked " or "Worked 200" Certificates! For the other tificates and stickers, only an alphabetized list- , verified by another ham is necessary, this list be sent directly to us.

We hope that this service will encourage more stations to apply for the *CQ* Awards for S.S.B. and feel confident that the fine cooperation unteered by ZS6AMV and the R.S.E.A. Awards nager will be appreciated by our fellow side- nders outside of the States.

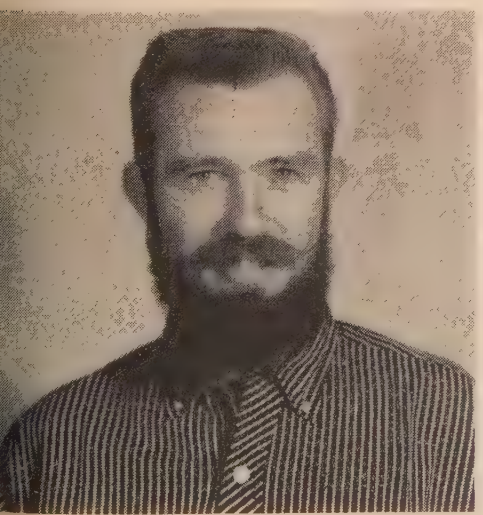
A reminder—Steve, G2BVN, (R. F. Stevens, 51 tits Lane, Romford, Essex, England) is checking the confirmations for sidebanders in the United gdom and in Ireland.

All of these affiliated stations have S.S.B. DX ing forms for your use and will be happy to d them to you on receipt of a stamped, self ad- ssed envelope. When sending your cards to m, *Please Be Sure To Include Return Postage.*

S.S.B. DX Awards

The list of sidebanders earning stickers and cer- cates for S.S.B. DX operation continues to w and grow and grow. W9LAA, W9ZTD, AYD, W2ATM, K3AMC, K5OGP, and W3- F broke the ice this month by earning their orked 50" countries Certificates while VE3CIO, KPP, W8WT, and G3NUY added the "Worked " Certificates to their collections. W7EUD, K9- G, W3COG, W3KPP, and G2BVN got closer Honor Roll mention by submitting proper con- firmations for the "Worked 100" award. Incidentally, Steve, G2BVN, is the first sideband operator in England to qualify for this award; our congratulations to him! Stickers were also issued to W2YBO, W6VUW, and W2NUT for "Worked 125" and to KØCTL and W5KFT for "Worked 150."

Again let us remind you that alphabetized listings must accompany your cards and that forms for listing your confirmations are available and may be obtained from us at the above address upon receipt of a stamped, self-addressed envelope. We appreciate the fact that all who have submitted their cards have included return postage and emphasize that this is an absolute necessity if you wish to have your confirmations returned to you!



Cal, ex-5A5TR, YA1IW, who is now in Algiers.

A Helping Hand For More Sideband

In his October HAM CLINIC Column, Chuck Schauers, F7FE, came up with a real fine suggestion that we feel should be picked up and supported by those among us who enjoy talking with our DX friends. Chuck points out that mechanical filters are financially out of reach of most foreign hams and the lack of good precision test equipment makes the construction of phase-shift networks most unsatisfactory. So Chuck suggests that all those interested in seeing more s.s.b. stations on the air from DX lands, arrange to send a B&W phase shift network, the 2Q4 (Model 350), to DX operators who are interested in getting on s.s.b. Chuck will make available, through the HAM CLINIC, additional information they may need to construct a s.s.b. exciter around the 2Q4 unit. The B&W unit sells for $4.65 and would make an overseas ham real happy as well as spread around a bit of good will.

Since most of us on s.s.b. talk with other hams on s.s.b., you might well ask how you can help when you don't know any DX hams on anything else but s.s.b. One way is to drop a card to Chuck, care of *CQ* and the name of an embryo DX s.s.b.'r will be on its way to you.

We're sure you will agree that this project is worth while; so let's get behind it and give it real support.

Uncledave, W2APF, Visits Vatican City

A letter from Uncledave, W2APF, discloses the following details of his visit to Vatican City in October:

"I arrived in Rome on Sunday, October 16, 1960 and checked in at the Hotel Excelsior. Almost immediately I received a telephone call from Dr. Louis Castaldi, I1CL, telling me he had heard from several friends advising him of my visit and hoping to be able to have him act as an interpreter to operate HV1CN. The Chief Operator of HV1CN is Domenico Petti, and his personal call is I1CNS, he also acts as station custodian.

"I was amazed to see the beautiful layout of the complete Hallicrafters station consisting of an HT-32A, HT-33, SX-101A and speaker, also a TO-1 keyer. There also are about a dozen SX-62A's scattered around the Vatican.

"I was then invited in to meet Father Steffan-

izi, who is head of broadcasting and Father Pellegrino, who is considered the Voice of the Vatican, after meeting these two wonderful and humble people, I was escorted into HV1CN and the Hallicrafters equipment was turned on and warmed up. After listening how difficult it was to receive signals because of harmonics on 20 Meters from broadcast transmitters in the vicinity, if we could have turned the beam it may not have been so bad but their rotor was in-operative. Since then a new Cornell Dubilier Ham-M has been sent to them and should be in operation by now. Not being able to operate on 20 meters we tried 15 and after a search of the band, I found an opening and had the pleasure of working among others, K1IDW, W2AOW, W3ECR, W2HYV, WØFUH, GI3IVJ, DJ1LN, W5LV/MM, and VQ3GL. Conditions on 15 were very, very bad during the three days of operation.

"On Monday, October 17, I operated four hours. On Tuesday, October 18, two hours. On Wednesday, the group I was with and myself had an audience with the Pope. Thursday, October 20, I again operated for about two hours.

"I also visited the Laboratories and workshops of the Vatican and was very much impressed with them and also had the pleasure of seeing Domenico Petti, the Custodian, in action in the Studios, Control rooms and at the Transmitter Sites. He certainly moves fast. I also met Mario Durante, the operator of Vatican Radio. Later, Domenico Petti, Loris and Mario drove me in and around the Vatican Gardens and as is typical of all hams, they made me feel right at home."

A Bit of A.L.C.

Automatic Load Control or Automatic Level Control or just plain a.l.c., is one of the things that the new sidebander meets for the first time. It may go under different names, but it all does the same thing—enables the power amplifier to work near its maximum capability without being overdriven on power peaks. In a.m. we use speech compressors and clippers to do the same thing. In s.s.b. however, these methods do not have the same usefulness as the s.s.b. peaks do not necessarily correspond with the peaks of the audio signal. The most effective method in use today is to use the output envelope peaks of the final amplifier to control the gain of the exciting signal. This is what we mean by Automatic Load Control or a.l.c.

To do this effectively, we must have a circuit who will rectify the sampling r.f. from the output and feed it back to a lower level stage to control the peaks. The figure below is a simplified schematic of an a.l.c. circuit. The circuit uses two variable gain stages of remote cut-off tubes operating like the i.f. stages of a receiver with a.v.c. The grid voltage of the amplifiers is obtained from the rectifier which is connected to the plate circuit of the power amplifier. A capacity voltage divider is used to step down the voltage to the a.l.c. rectifier to about 50 volts. The bias delay is used so that no reduction of gain takes place until the signal level is almost up to the full power limit of the power amplifier. At that point, the a.l.c. begins to take over and the exciter gain to the power amplifier is reduced to prevent the overloading of the power amplifier and resultant distortion and splatter. The output of the a.l.c. rectifier passes through filter networks to obtain the desired attack and release time. The attack time is quite fast, about two milli-seconds, so that the gain is reduced rapidly to prevent the p.a. overloading. The release time is much longer, about one-tenth second.

The a.l.c. circuit performs the function of a speech compressor for our purposes and for this end, about 12 db of control is the maximum that is necessary. If more compression is necessary, a speech compressor in the input audio amplifier is usually used to limit the range of the signal into the s.s.b. generator.

Some exciters do not use a.l.c. but attempt to do all the limiting at a low level in the audio stages by means of audio bandpass limiting filters. If properly designed, they will also assist in limiting the peak voice frequencies to the power amplifier.

The effectiveness of the a.l.c. circuit in limiting the output signal to the capabilities of the power amplifier is shown below.

If your rig does not have a.l.c., it should have some form of limiting to prevent overloading.

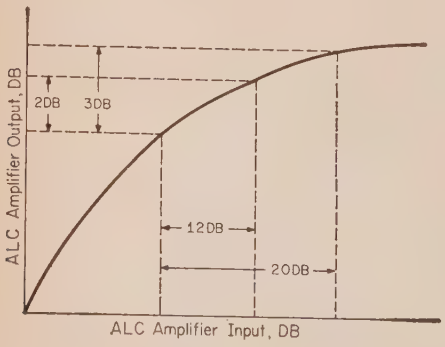


Fig. 2—ALC performance chart.

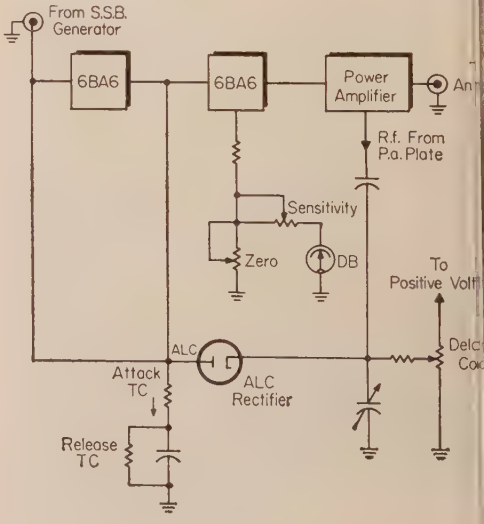


Fig. 1—ALC control circuit.

dio filter or limiter is not difficult to add and cuits are in the *Handbook* and s.s.b. literature.

Kansas City Sidebanders

Just about the time you come to accept the *tus quo,* someone comes along to shake things a bit. With all the nice new commercial s.s.b. ar to be had, it is an infrequent thing to hear m home brewers' of s.s.b. equipment. So to hear m a whole group is a real treat indeed. Jim, ØITO/AFØITO, writes that the ADC Mars Pro-m at Richards GeBaur Air Force Base is sponsor-; an s.s.b. Construction Project. The main theme the program is the construction of the "SSB ckage Exciter" from the ARRL *S.S.B. Handbook.* Among the MARS members and local hams, ØLRC, WØITO, KØTZN and KØURW are build-; or have built exciters with excellent results. rious linear amplifier designs are being explored future construction projects.

Our hats are off to the group in Kansas City; hope that they will serve as an inspiration to ıer groups to sponsor community s.s.b. projects.

A Resolution You Can Keep

New Year's resolutions are usually made to be ɔken but here's one that if kept will bring un-d benefits to *everyone* who operates the 20 ter band.

"Starting immediately I will consider the region .295 to 14.300 kc exclusively for the trans-tting use of s.s.b. amateurs outside the conti-nts of North and South America. It will therefore my listening region for good, interference free ζ, including DXpeditions, 24 hours a day."

This is one of the five resolutions that should be de and *kept* by all 20 meter operators and is part a letter which is being circularized by the ark IV DX Association consisting of Dale, 2ZX; K2DCA; K2OEA and W2FXN.

This small group is making a valiant effort to re-re some semblance of order to DX operations on meters. It's high time that W/K hams take a od long look at themselves and ask whether it 't in the best interests of all that we begin to nk of the problems of the low power DX station. r sideband brethren have just about decamped masse from the band because they find it im-ssible to operate in the middle of the QRM gen-erated by the sloppy operating that characterizes so much of the band today.

The plan proposes that we leave this small 5 kc segment as a calling frequency for DX stations. Surely we could be that considerate as to *spare* 5 kc for the DX'er!! Or would you prefer to give up the thrill of talking with that rare one yourself?

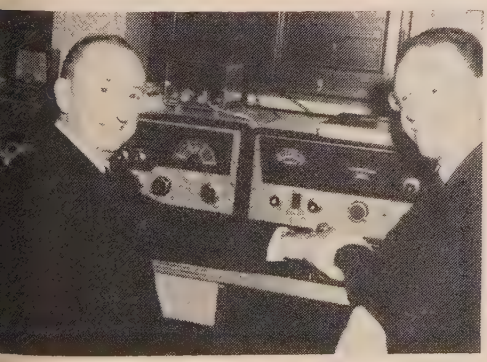
If you are interested in further details of this plan—and you all should be—write to Dale Kentner, W2ZX, RFD 1, Marlton, New Jersey.

Miami Hamboree Jan. 14-15

The Tropical Hamboree of 1961 is scheduled for Jan. 14-15 at the Bayfront Park Convention Auditorium in Miami, Florida. Sponsored by the Dade Radio Club Inc., the Hamboree will feature contests, tech-talks, forums and a ham auction. The main speaker at the Banquet will be Gus Browning, W4BPD, who will describe his DXpedition through Europe, Africa, the Indian Ocean and other exotic spots. Banquet tickets are $5.00 and Hamboree registration is $1.00 with registration before Jan. 1 entitling you to an extra ticket for a guest and/or door prizes. What really caught our eye in the announcement was the main prize—a complete s.s.b. Station consisting of an HT-37, SX-111, Speaker, Key, and Antenna! Winners need not be present to participate in the prize drawing so sidebanders or would-be sidebanders, this may be your big chance to win a new station. Send for tickets to PO Box 104, Miami 1, Florida.

Sideband Around The World

Cal, ex-5A5TR, YA1IW, etc., is now in Algiers, hoping to get that elusive license so that he can put another rare call on the air . . . Tino, I1II, made a most welcome visit to the States in November and met a number of his s.s.b. contacts . . . Poor conditions threw a wet blanket over some of the activities of Gus, W4BPD. Last we heard of him, he was operating as VQ1A; his future plans included visits to 6O1 and FL8. We hope the plans went through and that you got the new countries . . . It was a delight to hear Bob, TG9AD, back on the air again during the *CQ* DX Contest. Although he's been very busy, he hopes to find more time for operating and should participate in the s.s.b. DX



Uncledave, W2APF, left, with Domenico, chief operator at HV1CN.

Left to Right, Norm, K8EJY, Art, W8FPZ, and Ron, K8AEC, mastermind behind the 75 meter Interstate Sideband Net.

Contest—a TG9 prefix would be a nice added touch, especially when used by Bob, TG9AD . . . So many of us missed hearing George, PJ2AA, that it was good to learn he has returned from a year's visit to Europe and will be on s.s.b. more often. In addition to collecting people via ham radio, Augie, EL1G, ex-EL9A, also collects bugs and snakes on the Firestone Plantation in Liberia . . . Rao, VU2NR, confirmed that his plans to visit the Laccadives the first week in January were definite. . . There is a 40 meter Latin American s.s.b. Club which meets every Saturday, 0300 GMT, on 7295 lower sideband. According to Wellington, PY2PJ, the MC's of the round table are OA4DQ and PY2QT and the group includes sideband stations in all of Latin America . . . Two new awards are now available: "The Golden City Award," achieved by working 15 stations with "Johannesburg" in their address since May 30, 1960. QSLs with 5 IRCs may be sent to "Awards Manager," G.C.A., PO Box 2327, Johannesburg, South Africa. The other new award is being offered by a new DX Club in Capetown, "The Lion's Head Radio Club Award" for contacts with any 3 of the club's members since Sept. 30, 1960. Sidebanders in the club are George, ZS1JD; Phil, ZS1TP; Hector, ZS1RJ; Anita, ZS1TZ; and Ron, ZS1NE. All of these operators are partial to 10 meters. Send your three cards with 7 IRCs to "Max, ZS1ACD, Lion's Head Radio Club, P.O. Box 1167, Capetown, South Africa". . . Neville, G3 NUG, was pleased to have Henry, W9AK, and Anita, ZS1TZ, as visitors during the Fall . . .

Milkos, CT3AA, put Madeira Island on s.s.b. when he appeared on 21.419 during November. Fernando, CT3AV, left the air for several weeks while he converted his rig from double to single sideband . . . That was quite a bit of activity that took place from San Andres in November for six days. Using the call, HKØHCA, the operators included W8NWO, K8NZD, YN1CAA, YN1TAT, and YN1CK. Three sideband transmitters were in use on 10, 15, 20, and 40 . . . According to a letter received by Doc, W5RHW, Pat and Jere, ex-I5GN, were in Peekskill, New York, sans call, but listening to all their friends. It will be very nice to welcome them back to sideband with stateside calls . . .Stan, VK1SB, tells us that he is the only VK1 meter sideband, obviously a rare call since a station who worked him thought he was a much to Stan's annoyance . . . Pete, ZD2PJB created quite a pile up when he appeared meters in November, is engaged in seismic ation work in Nigeria which necessitates his away from his QTH about three weeks at and gives him only 5 days each month for ting . . . John, ZE4JN, had high hopes of ope as VQ9JER from Dec. 20 to Jan. 20 during to the Seychelles. It was interesting to learn John that the islands, which are 92 in numbe 1,000 miles from the mainland and that makes the trip only once a month . . . Wit usual thoroughness, Jo, CR6CA, started dis ing his cards for the CR5MA-Sao Thome D tion as soon as he returned to Angola. Jo now to visit Ajuda in January.

Band Hopping

Milt, W5IXL, got more than he bargained from amateur radio! During one of the meeti the New Orleans Medical A.R.C., a hand young ham showed up at Milt's home, too look at his beautiful daughter, and, two later, Julius, K5VMN, and Donna announced engagement. We've never heard a prospecti ther-in-law more ecstatic than Milt is when ing about Julius . . . At long, long last, the fo hopes of Fred, W4CF, were realized. After uring the four legs of the FPM-200 for s years, Fred finally received the "body" of t . . . Roy, K2KHR, worked WAC in one hou 6 different contacts—not to unusual to acco several years ago but quite a feat under today' ditions . . . Harry, W2JXH, has a good sugg for making life more pleasant for stateside managers. He suggests sending along a di stead of a stamp on your self-addressed en so that the overage can help pay for the co printing up the QSLs . . . There was probab one happier about sideband than Vincent, W when he finally got himself a new HT-37 a band beam and made his first contact wit

[*Continued on page 114*]

Bart, W8NWO, one of the operators of HKHCA, with Dorothy, K2MGE.

Harry, ZL3MA, whose Earnshaw exciter, 805 fin and V beams put fine signals into both coasts the States on 20 meter sideband (Photo courte of ZL3RT).

PROPAGATION

George Jacobs, W3ASK
11307 Clara St., Silver Spring, Md.

LAST MINUTE FORECAST

The forecast indices for the month of January, shown in the Propagation Charts by parentheses following the predicted time of openings, are expected to be related to day-to-day propagation conditions in the following manner:

Forecast Indices	Above Normal Jan. 1-3, 27-30	Normal Jan. 4, 11-13, 16-17, 19-22, 26, 31	Below Normal Jan. 14-15, 18, 23-25	Disturbed Jan. 5-10
(1)	C	D-E	E	E
(2)	B	C-D	E	E
(3)	A	B-C	D-E	E
(4)	A	A	B-C	C-D

Where:

A—Excellent circuit with strong steady signals

B—Good circuit, moderately strong signals, with some fading and noise.

C—Fair circuit, signals fluctuating betwen moderately strong and weak, with moderate fading and noise.

D—Poor circuit, signals weak, with considerable fading and very high noise level.

E—Circuit not possible.

General Conditions

Typical winter propagation conditions are ex-ected to continue through January and early Feb-ary. Maximum usable frequencies remain high ring the daylight hours, dropping to very low lues during the hours of darkness. Atmospheric ise levels (static) are at their lowest values of e year in the northern hemisphere, and signal vels are expected to be strong during times of band enings.

Although fairly frequent 10 meter openings are recast to many areas of the world, the 15 meter nd will probably be the best band for DX during e daylight hours. DX openings to many areas the world are forecast for 20 meters from dawn rough the evening hours, with conditions peaking sunrise, during the late afternoon hours, and ain during the early evening hours.

During the hours of darkness fairly good DX nditions are forecast for 40 meters, and both the and 160 meter bands should open for DX dur-g periods of exceptionally low static levels.

The intensity of the present solar cycle has now diminished to the point where it is very unlikely that any regular *F*-layer 6 meter DX openings will occur during January or February.

This month's column contains DX Propagation Charts for January and February, 1961. Short-Skip Propagation Charts for January appeared in last month's column.

Solar Cycle

The Swiss Federal Solar Observatory reports a monthly mean sunspot number of 81 for October, 1960. This is the lowest level of solar activity recorded since January, 1956.

October's mean sunspot number results in a 12 month running smoothed sunspot number (upon which the solar cycle is based) of 118 centered on April, 1960.

A 12 month smoothed sunspot number of 94 is predicted for January, 1961. The solar cycle is expected to continue its steady decrease during the new year, declining to a value of approximately 57 by the end of the year. (See sunspot cycle graphs, page 76, *CQ*, September 1960).

A comprehensive special report dealing with the declining solar cycle, and its probable influence upon propagation conditions in the amateur bands, is nearing completion. It's scheduled to appear in *CQ* during the spring months.

Contest Critique

The phone section of *CQ*'s DX Contest was held from 0200 GMT October 29 through 0200 GMT October 31. The long-range propagation forecast given in October's column called for seasonally normal conditions on October 29th and 30th, but becoming at least moderately disturbed by the 31st.

Unfortunately, as those of you who participated in the contest found out, the disturbance began earlier than predicted. Conditions were poor on the 29th, especially on the trans-Atlantic path. They improved slightly on the 30th and 31st, but never rose much above poor during the entire contest period.

The severe radio storm, and the generally poorer propagation conditions resulting from reduced solar activity, will no doubt keep scores in this year's phone contest far below the record breaking high scores compiled during the contests of the past four years.

A critique of the c.w. contest period will be included in next month's column.

JANUARY-FEBRUARY, 1961

TIME ZONE: EST

Eastern USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	7 A - 8 A (1) 8 A - 9 A (2) 9 A - 12N (3) 12N - 1 P (2) 1 P - 3 P (1)	7 A - 8 A (2) 8 A - 11A (3) 11A - 12N (4) 12N - 1 P (3) 1 P - 2 P (2) 2 P - 4 P (1)	4 A - 7 A (1) 7 A - 9 A (2) 9 A - 11A (1) 11A - 1 P (2) 1 P - 3 P (3) 3 P - 5 P (2) 5 P - 12M (1)	3 P - 5 P (1) 5 P - 7 P (2) 7 P - 12M (4) 12M - 3 A (2) 3 A - 4 A (1) 7 P - 10P (2)* 10P - 3 A (1)*
Eastern Europe	7 A - 8 A (1) 8 A - 10A (2) 10A - 12N (1)	7 A - 8 A (1) 8 A - 11A (2) 11A - 2 P (1)	11A - 4 P (1) 7 P - 12M (1)	8 P - 12M (1) 9 P - 11P (1)*
North Africa	7 A - 10A (2) 10A - 12N (3) 12N - 2 P (2) 2 P - 3 P (1)	7 A - 11A (2) 11A - 12N (3) 12N - 1 P (4) 1 P - 2 P (3) 2 P - 3 P (2) 3 P - 5 P (1)	6 A - 8 A (2) 8 A - 1 P (1) 1 P - 2 P (2) 2 P - 3 P (3) 3 P - 8 P (2) 8 P - 2 A (1)	4 P - 7 P (1) 7 P - 1 A (3) 1 A - 3 A (1) 7 P - 1 A (2)*
South Africa	6 A - 9 A (1) 9 A - 11A (2) 11A - 3 P (3) 3 P - 4 P (2) 4 P - 5 P (1)	6 A - 10A (1) 10A - 2 P (2) 2 P - 4 P (4) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 8 P (1)	1 P - 3 P (1) 3 P - 4 P (2) 4 P - 7 P (3) 7 P - 10P (2) 10P - 2 A (1)	6 P - 10P (1) 7 P - 9 P (1)*
Eastern Mediterranean	7 A - 8 A (1) 8 A - 10A (2) 10A - 2 P (1)	7 A - 9 A (1) 9 A - 12N (2) 12N - 2 P (1)	11A - 1 P (1) 1 P - 5 P (2) 5 P - 2 A (1)	7 P - 11P (1) 8 P - 10P (1)*
Central Asia	9 A - 1 P (1) 5 P - 8 P (1)	9 A - 12N (1) 6 P - 8 P (1)	7 A - 9 A (1) 1 P - 3 P (1) 7 P - 9 P (1)	6 P - 9 P (1) 4 A - 6 A (1)
Southeast Asia	11A - 2 P (1) 6 P - 8 P (1)	10A - 1 P (1) 6 P - 8 P (1)	7 A - 9 A (2) 12N - 2 P (1) 7 P - 9 P (1)	NIL
Far East	6 P - 8 P (1)	8 A - 10A (1) 5 P - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (1)	6 P - 7 P (1) 7 P - 9 P (2) 9 P - 4 A (1) 4 A - 7 A (2) 7 A - 9 A (1)	3 A - 6 A (1)
Pacific Islands	12N - 2 P (2) 2 P - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (1)	8 A - 11A (1) 11A - 1 P (2) 1 P - 6 P (1) 6 P - 8 P (2) 8 P - 10P (1)	5 P - 8 P (1) 8 P - 11P (2) 11P - 7 A (1) 7 A - 9 A (3) 9 A - 11A (2) 11A - 1 P (1)	2 A - 4 A (1) 4 A - 6 A (2) 6 A - 8 A (1) 4 A - 7 A (2)*
Australasia	2 P - 5 P (1) 5 P - 7 P (2) 7 P - 10P (1)	9 A - 11A (2) 11A - 6 P (1) 6 P - 9 P (2) 9 P - 11P (1)	8 P - 12M (1) 12M - 4 A (2) 4 A - 7 A (1) 7 A - 9 A (3) 9 A - 10A (2) 10A - 12N (1)	3 A - 5 A (1) 5 A - 7 A (2) 7 A - 8 A (1) 5 A - 7 A (1)*
South America	7 A - 2 P (2) 2 P - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	6 A - 7 A (2) 7 A - 9 A (3) 9 A - 2 P (2) 2 P - 4 P (3) 4 P - 7 P (4) 7 P - 9 P (3) 9 P - 1 A (2)	6 A - 8 A (2) 8 A - 3 P (1) 3 P - 6 P (2) 6 P - 12M (4) 12M - 2 A (3) 2 A - 6 A (1)	7 P - 9 P (2) 9 P - 2 A (3) 2 A - 4 A (2) 8 P - 2 A (2)*
McMurdo Sound, Antarctica	8 A - 10A (1) 9 P - 11P (1)	7 A - 8 A (1) 8 A - 9 A (2) 9 A - 8 P (1) 8 P - 11P (2) 11P - 3 A (1)	7 P - 9 P (1) 9 P - 12M (2) 12M - 2 A (3) 2 A - 4 A (2) 4 A - 8 A (1)	12M - 5 A (1)

TIME ZONE: CST & MST

Central USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	8 A - 9 A (1) 9 A - 11A (2) 11A - 1 P (1)	7 A - 10A (2) 10A - 12N (3) 12N - 1 P (2) 1 P - 3 P (1)	7 A - 8 A (1) 8 A - 2 P (2) 2 P - 11P (1)	6 P - 9 P (1) 9 P - 1 A (2) 1 A - 2 A (1) 8 P - 1 A (1)*
Eastern Europe	8 A - 11A (1)	8 A - 9 A (1) 9 A - 11A (2) 11A - 12N (1)	7 A - 8 A (1) 8 A - 11A (2) 11A - 2 P (1) 8 P - 11P (1)	8 P - 1 A (1)
North Africa	8 A - 9 A (2) 9 A - 11A (3) 11A - 12N (2) 12N - 1 P (1)	8 A - 10A (2) 10A - 12N (3) 12N - 1 P (2) 1 P - 3 P (1)	7 A - 12N (1) 12N - 2 P (3) 2 P - 5 P (2) 5 P - 1 A (1)	6 P - 8 P (1) 8 P - 11P (2) 11P - 1 A (1) 7 P - 11P (1)*
Central Africa	8 A - 11A (2) 11A - 1 P (3) 1 P - 3 P (4) 3 P - 5 P (3) 5 P - 6 P (2) 6 P - 7 P (1)	7 A - 10A (1) 10A - 1 P (2) 1 P - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 8 P (1)	11A - 1 P (1) 1 P - 4 P (2) 4 P - 8 P (3) 8 P - 11P (2) 11P - 1 A (1)	6 P - 10P (1) 7 P - 9 P (1)*

TIME ZONE: CST & MST, Con't.

Central USA To:

	10 Meters	15 Meters	20 Meters	40/80* M
Eastern Mediterranean	8 A - 11A (1)	7 A - 8 A (1) 8 A - 11A (2) 11A - 1 P (1)	11A - 4 P (1) 11P - 1 A (1)	6 P - 10
Central Asia	9 A - 11A (1) 6 P - 9 P (1)	8 A - 10A (1) 7 P - 9 P (2) 9 P - 10P (1)	7 A - 9 A (2) 9 A - 11A (1) 7 P - 8 P (1) 8 P - 9 P (2) 9 P - 11P (1)	4 P - 7 5 A - 7
Southeast Asia	11A - 2 P (1) 5 P - 7 P (1)	10A - 12N (2) 12N - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (1)	9 A - 12N (2) 12N - 2 P (1) 6 P - 8 P (1)	NIL
Far East	4 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (1)	9 A - 11A (1) 2 P - 4 P (1) 4 P - 6 P (2) 6 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	4 P - 7 P (1) 7 P - 9 P (2) 9 P - 7 A (1) 7 A - 9 A (2) 9 A - 11A (1)	2 A - 7
Pacific Islands	11A - 2 P (2) 2 P - 5 P (1) 6 P - 8 P (2) 8 P - 10P (1)	10A - 2 P (2) 2 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	9 A - 11A (2) 11A - 7 P (1) 7 P - 10P (2) 10P - 12M (3) 12M - 5 A (2) 5 A - 7 A (1) 7 A - 9 A (3)	12M - 6 6 A - 8 1 A - 6 6 A - 7
Australia	9 A - 11A (2) 11A - 4 P (1) 4 P - 5 P (2) 5 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	8 A - 9 A (1) 9 A - 12N (3) 12N - 3 P (2) 3 P - 7 P (1) 7 P - 9 P (2) 9 P - 11P (1)	11A - 11P (1) 11P - 1 A (2) 1 A - 7 A (1) 7 A - 8 A (2) 8 A - 10A (3) 10A - 11A (2)	5 A - 7 7 A - 8 5 A - 7
New Zealand	11A - 4 P (2) 4 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	7 A - 9 A (1) 9 A - 12N (2) 12N - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	11A - 8 P (1) 8 P - 10P (2) 10P - 3 A (3) 3 A - 6 A (2) 6 A - 8 A (1) 8 A - 11A (2)	2 A - 7 6 A - 8 4 A -
South America	7 A - 1 P (2) 1 P - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 8 P (1)	6 A - 7 A (2) 7 A - 9 A (3) 9 A - 2 P (2) 2 P - 4 P (3) 4 P - 7 P (4) 7 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	6 A - 8 A (2) 8 A - 2 P (1) 2 P - 6 P (2) 6 P - 10P (4) 10P - 2 A (3) 2 A - 6 A (1)	7 P - 9 9 P - 1 2 A - 4 8 P - 2
McMurdo Sound, Antarctica	7 A - 9 A (1) 8 P - 10P (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 6 P (1) 6 P - 10P (2) 10P - 2 A (1)	6 P - 9 P (1) 9 P - 12M (2) 12M - 3 A (3) 3 A - 8 A (2) 8 A - 10A (1)	1 A - 5

TIME ZONE: PST

Western USA To:

	10 Meters	15 Meters	20 Meters	40/80* M
Western Europe	7 A - 10A (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 1 P (1)	5 A - 8 A (1) 8 A - 12N (2) 12N - 8 P (1)	6 P - 12 7 P - 11
Eastern Europe	7 A - 9 A (1)	7 A - 11A (1)	2 P - 6 P (1) 6 P - 8 P (2) 8 P - 7 A (1) 7 A - 9 A (2) 9 A - 10A (1)	7 P - 11 8 P - 11
North Africa	7 A - 8 A (1) 8 A - 10A (2) 10A - 11A (1)	7 A - 8 A (2) 8 A - 10A (3) 10A - 11A (2) 11A - 1 P (1)	5 A - 8 A (1) 8 A - 12N (2) 12N - 8 P (1) 11P - 1 A (1)	6 P - 11 7 P - 10
South Africa	7 A - 9 A (2) 9 A - 11A (3) 11A - 2 P (2) 2 P - 4 P (1)	6 A - 9 A (1) 9 A - 11A (2) 11A - 1 P (3) 1 P - 3 P (4) 3 P - 5 P (3) 5 P - 6 P (2) 6 P - 7 P (1)	10A - 12N (1) 12N - 3 P (2) 3 P - 4 P (3) 4 P - 6 P (4) 6 P - 8 P (3) 8 P - 10P (2) 10P - 12M (1)	6 P - 8 6 P - 8
Eastern Mediterranean	7 A - 9 A (1)	7 A - 11A (1)	5 A - 8 A (1) 8 A - 10A (2) 10A - 12N (1)	5 P - 8
Central Asia	8 A - 10A (1) 5 P - 6 P (1) 6 P - 7 P (2) 7 P - 8 P (1)	8 A - 10A (1) 4 P - 5 P (1) 5 P - 7 P (2) 7 P - 8 P (1)	7 A - 9 A (2) 9 A - 11A (1) 5 P - 6 P (1) 6 P - 7 P (2) 7 P - 9 P (1)	NIL

TIME ZONE: PST, Con't.

estern USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
uthest	9 A - 11A (1)	8 A - 10A (1)	7 A - 9 A (1)	4 A - 7 A (1)
ia	3 P - 4 P (2)	10A - 11A (2)	9 A - 11A (3)	4 A - 6 A (1)*
	4 P - 6 P (3)	11A - 3 P (1)	11A - 12N (2)	
	6 P - 7 P (2)	3 P - 7 P (2)	12N - 2 P (1)	
	7 P - 8 P (1)	7 P - 9 P (1)	7 P - 10P (1)	
r	1 P - 2 P (1)	8 A - 10A (1)	8 A - 10A (2)	12M - 7 A (3)
st	2 P - 3 P (2)	1 P - 2 P (1)	10A - 2 P (1)	7 A - 9 A (1)
	3 P - 5 P (4)	2 P - 3 P (2)	2 P - 7 P (2)	2 A - 6 A (2)*
	5 P - 6 P (3)	3 P - 6 P (3)	7 P - 9 P (3)	
	6 P - 7 P (2)	6 P - 7 P (4)	9 P - 11P (1)	
	7 P - 8 P (1)	7 P - 8 P (3)		
		8 P - 10P (1)		
cific Islands				
New Zealand				
	8 A - 9 A (1)	7 A - 8 A (1)	11A - 6 P (1)	11P - 3 A (2)
	9 A - 3 P (2)	8 A - 11A (3)	6 P - 9 P (2)	3 A - 6 A (3)
	3 P - 6 P (3)	11A - 6 P (2)	9 P - 1 A (4)	6 A - 7 A (1)
	6 P - 7 P (2)	6 P - 8 P (4)	1 A - 3 A (2)	12M - 4 A (1)*
	7 P - 9 P (1)	8 P - 10P (2)	3 A - 7 A (1)	4 A - 6 A (2)*
		10P - 12M (1)	7 A - 9 A (3)	6 A - 7 A (1)*
			9 A - 11A (2)	
stralia	10A - 12N (1)	9 A - 12N (2)	7 A - 9 A (2)	3 A - 6 A (3)
	12N - 3 P (2)	12N - 2 P (3)	9 A - 10A (3)	6 A - 8 A (1)
	3 P - 7 P (3)	2 P - 4 P (2)	10A - 12N (2)	4 A - 7 A (2)*
	7 P - 8 P (2)	4 P - 6 P (1)	12N - 7 P (1)	
		6 P - 9 P (2)	7 P - 9 P (2)	
	8 P - 9 P (1)	9 P - 11P (1)	9 P - 4 A (1)	
th	6 A - 7 A (1)	6 A - 8 A (3)	2 P - 4 P (2)	7 P - 11P (3)
erica	7 A - 12N (2)	8 A - 12N (2)	4 P - 6 P (3)	11P - 2 A (2)
	12N - 1 P (3)	12N - 3 P (3)	6 P - 8 P (4)	8 P - 11P (2)*
	1 P - 3 P (4)	3 P - 5 P (4)	8 P - 10P (3)	11P - 1 A (1)*
	3 P - 5 P (2)	5 P - 7 P (3)	10P - 1 A (2)	
	5 P - 7 P (1)	7 P - 8 P (2)	1 A - 5 A (1)	
		8 P - 12M (1)	5 A - 7 A (2)	
			7 A - 2 P (1)	
Murdo Sound,				
arctica				
	7 A - 10A (1)	6 A - 7 A (1)	4 P - 6 P (1)	10P - 5 A (1)
	8 P - 10P (1)	7 A - 9 A (2)	6 P - 8 P (2)	
		9 A - 6 P (1)	8 P - 2 A (3)	
		6 P - 10P (3)	2 A - 4 A (2)	
		10P - 12M (2)	4 A - 6 A (1)	
		12M - 2 A (1)	6 A - 8 A (2)	
			8 A - 10A (1)	

FORECAST INDICES

cults forecast to open:

Less than 7 days during each month of forecast period.

Between 8 and 13 days during each month of forecast period.

Between 14 and 22 days during each month of forecast period.

For more than 22 days during each month of forecast period.

A - A.M. P - P.M. N - Noon M - Midnight

"Last Minute Forecast" in text for the relationship between the Forecast ices and the day-to-day propagation conditions expected during the month.

ndicates expected 80-meter openings. On nights when atmospheric noise ditions are exceptionally quiet, 160-meter openings are likely to occur on ults during those times. 80-meter openings are rated (2) or higher.

CQ DX Propagation Charts are based upon a CW effective radiated power 50 watts at radiation angles less than thirty degrees. The Eastern USA rt can be used in the W1, W2, W3, W4 and W8 call areas; the Central Chart in the W5, W9 and WØ call areas, and the Western USA Chart in W6 and W7 areas. The Charts are valid through February 28, 1961. pagation forecasts contained in these Charts are based upon basic spheric data published by the Central Radio Propagation Laboratory of National Bureau of Standards, Boulder, Colorado.

Explorer VIII

n November 3, 1960 the National Aeronautics Space Administration (NASA) successfully ched Explorer VIII. This 90 pound aluminum llite is the first in a series of space experiments gned to unlock the secrets of the ionosphere. xplorer VIII is probing deep into the ionospheric on which extends from about 50 to several dred miles above the earth's surface. Loaded sensitive equipment, the satellite is making ct measurements of many of the ionosphere's racteristics for the first time. This information eing telemetered back to earth where scientists eve it will lead to a better understanding of the ise nature, extent and origin of the ionosphere. or details see this month's SPACE column.

73, George, W3ASK

DXpedition

DXpediter

Definitely not Copyrighted by
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Deer Run Road
Woodbridge 15, Conn.

The following (is) (is not at all) intended to convey the suggestion that traditional DXpedition reports are superfluous or not well written or have a monotonous sameness to them. (Perish the thought!). The suggestion grew out of the conviction that the wealth of invaluable data and information available from such reports should be tabulated and presented in a more (scientific) (soporific) format, with consequent great savings of (time) (space) (expense) (paper).

1. We left_____from_____, arrived at_____on_____.
2. Used call sign_____.
3. Transportation methods used:
   _____Boat
   _____Plane
   _____Dog sled
   _____Submarine
   _____Horses/Mules
4. Our equipment was:
   _____Transmitter _____Receiver
   _____Antenna _____Power Supply.
5. The following equipment was (donated) (loaned) by (Manufacturer) (dealer) (XYL):
   _____Transmitter _____Receiver
   _____Power Supply _____Pencils
6. Weather was:
   ___Fair ___Cold ___Wet ___Snow ___Hot
7. Natives were:
   ___Friendly ___Hostile ___Hungry ___Asleep
8. We set up station in or on:
   ___Hotel ___Tent ___Cave ___Flagpole
9. We operated:
   ___(Bands) ___(Modes) ___Total Hours
10. Total Contacts___ _____.
11. QSLs (will be) (have been) (will not be) sent to (those who contributed $_____).
12. We had (no) difficulty with:
    ___Transmitter ___Receiver ___Power
13. (U.S.) (all other) operators (were) (were not) extremely (courteous) (discourteous) in pile-ups.
14. We (did) (did not) have difficulty packing up for return trip.
15. We (will) (will not) return next year.
16. Photographs of expedition:
    ___Enclosed ___Didn't come out ___Lost. ■

Space Communications

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SILVER SPRING, MARYLAND

Explorer VIII

Blasted into space by a powerful Juno II carrier rocket, the National Aeronautics and Space Administration (NASA) successfully placed Explorer VIII into orbit on November 3, 1960.

Weighting 90 pounds, the aluminum cased Explorer VIII satellite is the first of a series of satellites designed to probe the ionosphere. The ionosphere is a region of electrified gas existing between approximately 50 and several hundred miles above the surface of the earth. Long distance radio communications is made possible by reflecting signals between the earth and the ionosphere. The new Explorer satellite is expected to collect important data which may contribute to advances and improvements is using the ionosphere more efficiently for radio communications.

Unlike the Courier and Echo satellites which herald radically new communication techniques, Explorer VIII has the mission of learning more about those things that can help improve existing communication systems and present day techniques.

Aboard the new satellite are eight separate sets of instruments for measuring the structure and properties of the ionosphere, and how the region changes in composition between the sunlight and dark areas of the world. Explorer's instruments will also be able to detect changes in the ionosphere resulting from sunspots, magnetic storms, auroral displays, and other natural disturbances which often disrupt radio communications.

Until the successful launching of Explorer VIII, only a very few characteristics of the lower region of the ionosphere could be measured continuously by ground-based ionospheric sounders. The new satellite makes it possible to measure for the first time on a continuous basis many characteristics of the ionosphere, such as electrical composition and temperature. Explorer VIII penetrates high into the ionized region obtaining data at heights far above the limit of ground-based ionospheric sounders.

Explorer VIII orbits the earth once every 113 minutes at heights varying between 258 and 1423 miles. As it traverses the ionosphere the satellite is telemetering its findings back to earth for study by communication, electronic and atmospheric specialists. The six channel telemetry system operates continuously by sending out bursts of amplitude modulation. There is only one transmitter on the satellite. It operates on 108 megacycles with an average radiation of 100 milliwatts from a linearly polarized cloverleaf antenna (a four loop ant

Scientists are optimistic that the newly ob information from Explorer VIII will eve unlock at least partially some of the secrets ionosphere. With greater knowledge of the nature, extent and origin of the ionosphere, someday be possible to make fuller use of effects which can improve radio communic and circumvent those which disrupt comm tions.

Although its radio transmitter is expected during early 1961, the Explorer VIII satellite remain in orbit for several years.

New Experiments Planned

Following up this first ionospheric probe, plans to place into orbit sometime during a special payload equipped with several radio mitters operating on different frequencies and of power. Such a satellite would be used to explore the ionosphere by radio propagation niques. By comparing the relative strength various signals received at ground stations it be possible to determine certain ionospheric c teristics of great importance in radio comm tions. It is possible that radio amateurs may to play an important role in this particular ment being planned by NASA. More inform will appear in this column as soon as NASA's are firmed up and announced to the public.

Objects In Orbit

Elsewhere in this column appears the amendment to the "Satellite Situation Report" originally appeared in October's column. The amendment contains vital statistics for bu and successful space launchings which took between September 13 and November 3, 19 previous amendment appeared in Nove column.

In the period covered by the latest amen the USA successfully placed three satellite orbit. On September 13, Discoverer XV (of called 1960 MU) was placed into polar orbit ing its 17th revolution, on September 1 capsule of Discoverer XV was successfully e It re-entered the earth's atmosphere and was s visually, floating in the Pacific Ocean near mas Island, about a thousand miles south of H Efforts to retrieve the capsule failed as hig caused it to sink.

Objects in Orbit

Object	Name	Launched By	Launch Date	Period (Mins.)	Inclination*	Apogee (statute miles)	Perigee (statute miles)	Transmitting Freq. (MC/S)
1960 MU	Discoverer XV	US	13 Sep 60	92.8	80.9	381	125	107.97
1960 NU 1	Courier 1 B	US	4 Oct 60	106.9	28.3	772	586	
1960 NU 2	Rocket Body	US	4 Oct 60	106.3	28.3	733	586	
1960 XI 1	Explorer VIII	US	3 Nov 60	112.7	50.0	1422.6	258	108

*Inclination given in degrees to the equator
Period is the time that it takes an object to complete its orbit
Apogee is the orbits greatest distance from the earth
Perigee is the orbits closest distance to the earth

Burned-Up Objects

Object	Name	Launched By	Launch Date	Burn-Up Date
1960 KAPPA	Discoverer XIV	US	18 Aug 60	16 Sep 60
1960 LAMBDA 2	Rocket Body	USSR	19 Aug 60	23 Sep 60
1960 EPSILON 7	None *	USSR	15 May 60	24 Sep 60
1960 EPSILON 5	None *	USSR	15 May 60	Sep-Oct 60 **
1960 EPSILON 6	None *	USSR	15 May 60	Sep-Oct 60 **
1960 EPSILON 8	None *	USSR	15 May 60	Sep-Oct 60 **
1960 EPSILON 9	None *	USSR	15 May 60	Sep-Oct 60 **
1960 MU	Discoverer XV	US	13 Sep 60	18 Oct 60

*Miscellaneous objects associated with the USSR's launching of Sputnik IV
**Exact date unknown

Score to November 3, 1960 — US: 30 successful launchings; 18 still in orbit
USSR: 8 successful launchings; 2 still in orbit

Additional satellite launchings since the listing in the November, 1960 column.

On October 4, the Courier 1-B active communica-ns satellite was successfully launched. The Cour- satellite was discussed in detail in last month's umn. Both the satellite and its rocket carrier are orbit.

Explorer VIII was successfully launched on No-nber 3. This satellite, discussed earlier in this umn, is designed to improve radio communica-ns by gathering scientific data for unlocking some the secrets of the ionosphere.

During the period between September 13 and vember 3, the carrier rockets of both Discoverer V and XV re-entered the earth's atmosphere and re destroyed by friction and heat. The burn-up Discoverer XIV was reported to have been seen ually in the Dutch West Indies, Puerto Rico, rida and New York.

Sputnik V's rocket carrier also burned-up during period, as did five miscellaneous objects as-iated with Sputnik IV (called "space garbage" in jargon of the space age).

A failure was reported on September 25 when NASA moon probe, Pioneer VI, was launched Cape Canaveral, Florida but failed to orbit due a malfunction in the second stage of the carrier ket.

As of November 3, the USA had successfully nched 30 space satellites in less than three rs. Twelve of these were still in orbit. The USSR, three years, had successfully launched 8 satel-s of which 2 were still in orbit.

Thanks are due the National Aeronautics and ce Agency for making available the vital statis- appearing in the situation report. Amendments his report will appear regularly in this column.

Echo Postage Stamp

On December 15, 1960 the United States issued a special 4¢ postage stamp honoring Echo, the world's first communications satellite. The stamp pictures the balloon satellites in orbit, and is available at local post offices throughout the country. This is the first postage stamp issued by the United States honoring a space achievement. Russia and several other countries previously have issued stamps to commemorate the successful launchings of Sputniks and Luniks.

Shortly before issuing the new stamp, the Post Office Department announced that Echo had been used experimentally as a space relay for transmis-

[*Continued on page 118*]

Diagram of the first "Speed Mail" space transmission experiment. A Speed Mail facsimile letter was sent by the Post Office Dept. from Washington, D. C. to Newark, N. J. via the Echo satellite.

RTTY

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Happy New Year! We trust Santa left a Model 28 in every RTTYer's stocking, or at least a Model 14 tape transmitter-distributor!

Last month, following the column pattern established with the June 1960 issue, we described a method of controlling an amateur radioteletype station. In the combination schematic and block diagram we showed one of the necessary units simply as a block labeled "AFSK Oscillator." This month we will describe in detail just what is in this particular block.

An AFSK Oscillator

As we mentioned in the November RTTY column, it occasionally becomes necessary to repeat ourselves. Therefore we will again describe an AFSK oscillator that was used for many years at W2JTP. This was first diagrammed in the November 1955 RTTY column. (In case you haven't noticed, *CQ* has been covering the subject of RTTY *consistently* for over five years.)

Figure 1 is the schematic diagram of the AFSK oscillator. While a 12AU7 is indicated as the oscillator tube, an octal-based 6SN7 could be substituted without any changes in the component values. The half-section of the 12AU7 shown as a buffer-amplifier could likewise be replaced with a half-section of a 6SN7. A 6C4 or 6J5 single triode could also be used. The type 1N69 diode would be a good substitute for the 1N34 diodes shown on the diagram as many 1N34's have quite a bit of leakage.

The circuit of the AFSK oscillator is of the type referred to as "cathode-coupled." The beauty of this circuit is that no tap on the coil is necessary, neither is a critical feedback adjustment required. Output is extremely stable and the wave form is a very pure sine wave. Once set up it will stay on frequency for years.

Coil Details

The inductance in the oscillator was built in[to] old TV coil can that had a powdered iron slu[g] justment out the top. The original coil wa[s] carded and a layer-wound winding from a[n] iron core audio transformer or choke was s[ub]tuted. The winding used measured 250 mhy (w[ith] the iron core), but anything around that valu[e] do quite nicely. The adjustable slug was retain[ed] it provided a very convenient vernier adjust[ment] The coil should be anchored with coil do[pe] cement to prevent any mechanical moveme[nt] vibration from affecting the frequency. It isn't n[ec]sary, by the way, for the winding to fit c[lo]around the iron slug.

Circuit Details

As mentioned briefly in the July, 1960, [RTTY] column, amateur AFSK operation uses the s[tan]ard tones, 2125 cycles for *mark*, and 2975 cycl[es] *space*. Now, remembering our machine theor[y] keyboard circuit is closed during *mark* and op[en] *space*. Therefore we must tune our osc[illator] initially to 2975 cycles with the keyboard c[ontact] circuit open. With the slug in the center, a c[apa]tance of slightly over .01 mf will do the tri[ck] your coil is 250 mhy. After your *space* is se[t] close the keyboard contact circuit and var[y] capacitance in series with the diode switch. If [the] coil is 250 mhy, this will also be a little over .[01] to bring the frequency to 2125-cycles. It is [sug]gested that either mica or mylar dielectric capa[citor] be used instead of the ordinary "paper" type.

The diode switch, or keyer, is of the "dry" [type] which means that the minute current, p[ass]through the keyboard is not enough to kee[p] contacts clean by itself, so a periodic cle[aning] procedure of the keyboard contacts is in order.

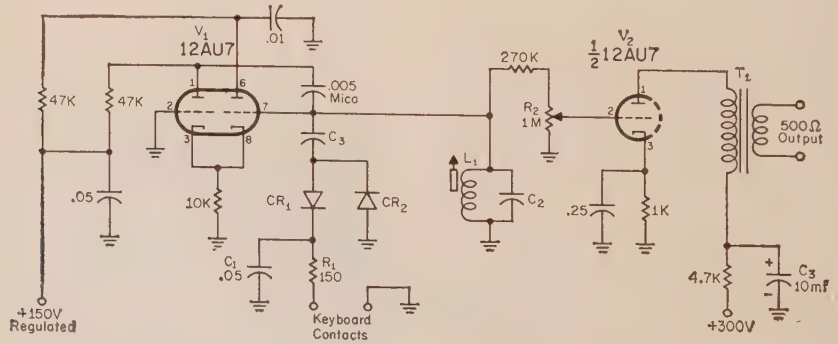


Fig. 1—AFSK Oscillator Circuit.

C1a—.05 mf disc ceramic
C2, C3—.01 mf (see text)

CR1, CR2—1N34 (see text)
T1—Output transformer Stancor A-3250

0 Ohm resistor in series with the contacts reduces e effect of any possible variation in contact resis- ıce and also serves, in conjunction with the .05 capacitor, as a wave-shaping filter, thereby re- cing the tendency of the *mark*-to-*space* transition produce transients. If you are running high power d there is the possibility of large amounts of stray floating around, it might be necessary to put a mhy r.f. choke in series with the hot side of the yboard contact leads. In any case, it is a good a to use shielded leads to your machine.

It will be noticed that the output amplitude of the ffer-amplifier is slightly higher on 2975 cycles than s on 2125 cycles. You can equalize output on the o frequencies very easily by padding the primary the output transformer with a capacitor if you sh; however, looking at the usual a.m. v.h.f. sys- n as a whole, the *overall* frequency response of m speech, modulator, and receiver audio am- fiers usually falls off around 2975 cycles, so it y not be necessary or wise to equalize in the SK oscillator unit itself.

W2JAV TU

Ever since we published the article on the now- nous W2JAV Terminal Unit in the April 1958 ıe of *CQ*,[1] we have been getting a steady stream letters regarding this very fine converter. While st report excellent results a few seem to be ask- the same questions, so now is a good time to iew the various questions and comments that have received.

First of all, many sharp-eyed readers have spotted omission in the schematic diagram, fig. 1: the und symbol was left off of the cathodes of V_4. ondly, no information was given on the input nsformer T_1. This was a surplus job, 500 Ohms 20,000 Ohms. Any input (or output used back- rds) transformer, 500 or 600 Ohms to anything und 15,000 to 25,000 Ohms will work. Barry ctronics in New York City has had some mighty 600 to 19,000 Ohm surplus transformers for each that are perfect for the purpose.

t was indicated on the schematic diagram that a volt plate supply with a capacity of 80 ma was uired. It is highly desirable that a power supply n good regulation be used, one with choke input ferably, with a heavy bleeder resistor, and with a *t* 80 mf in the output section of the filter. The emely low power supply impedance is manda- because we are dealing with switching fre- ncies around 22.8 cycles when keying a printer.

n fig. 3, the Polar Relay Supply schematic, there uld be no connection between the armature (1) he polar relay and the junction of its two coils 3).

t was noted that in some cases neon lamp I_4 uld not extinguish with no signal input. This ht be cured by increasing the value of the plate stor of V_{4A} to 1.5 megohms. This is because of ations in the characteristics of the many 12AX7 s made for "entertainment" purposes. If at all possible, scrounge a military version or "ruggedized" industrial equivalent, such as the 5751. If you must use ordinary 12AX7 tubes, check some on a trans-conductance-type of tube checker for reasonably good balance of the two triodes.

To answer the many questions concerning operation of this TU, it is almost essential to feed the receiver output through a band-pass input filter. (This is because limiters are such good harmonic generators.) It is a good idea, too, to insure the satisfactory operation of such a filter by isolating the input and output from receiver and TU, respectively, with a fixed pad or attenuator with at least 3 db loss, each. A simple but effective input filter was described in the RTTY column in the January, 1956, issue of *CQ*. Look up also the notch filter in the December, 1957, column.

[1] etzman, B., "An Improved Radioteletype Converter," April 1958, p. 42.

At the CATS RTTY Meeting, Chicago, October 9, 1960. From left to right, Spencer L. Clope W9LDH of Racine, Wisconsin; Donald C. Fisher, W9YBA, Whitewater, Wisconsin; and Tomi Tanimoto W9UMD of Chicago, viewing a transistorized TU belonging to W9UMD.

Portland, Oregon

Interest in RTTY in the Portland, Oregon, area is at an all time high. This group as yet does not have a formal name, but among others the name "Shiftless Amateur RTTY Club" (SARC) has been suggested. Ted Peterson, W7WWJ, 3705 S.W. Stephenson Street, Portland 19, Oregon, has been sending out a fine mimeographed bulletin to any and all interested hams in the area. It contains news and views, plus an occasional bit of technical informa-

[*Continued on page 116*]

YL

by Louisa B. Sando, W5RZJ
212 Sombrio Drive, Santa Fe, N.M.

12th Annual YL/OM Contest

W1ZEN, YLRL's V.P. for 1961, has announced these dates for the 12th Annual YL/OM Contest: Phone—Sat., Feb. 25, 1961, 1:00 P.M., EST to Sun., Feb. 26, 1961, 12 midnight EST. C.W.—Sat., Mar. 11, 1961, 1:00 P.M. EST to Sun., Mar. 12, 1961, 12 midnight EST. All licensed OMs, YLs, and XYLs throughout the world are invited to participate. Complete rules will be published in February *CQ*.

With the Clubs

Members of the Hoosier Amateur Women's Klub held their Fall meeting in October on the campus of Purdue University, at which time these officers were elected: President, K9IXD, Doris; V.P., K9KKG, Rosalie; sec'y, K9QJR, Norma; treas., K9SUT, Ann; directors, W9RTH, Adah, and W9LYU, Betty. The Klub observed its 3rd anniversary at this meeting, and its growth from 5 to 72 members. N.C.S. for the HAWK "Roost" is K9MZV with K9IXD as A.N.C.; Tuesdays 9 A.M. EST on 50.20 mc.

Remember Floridora Week, Jan. 8-15, 1961. As many of the Floridora YLs as possible will be on the air during this time to provide contacts for those wishing to earn the Floridora certificate. This group recently had some fine publicity in *The Miami Herald* with a write-up and photos of K4PCX, W4FEU and K4PPX.

PARKA has announced revised rules for the PARKA Lucky Seven Award. They were effective Jan. 1, 1960, but KL7 stations who qualified for PLSA on or before Dec. 31, 1959, are eligible under the old ruling.

1. Awarded to any amateur in the world who successfully completes two-way contact from the same location or within a 25-mile radius with seven paid-up members of PARKA (Polar Amateur Radio Klub of Alaska). The exception being that Alaskan amateurs must also show proof of contact with at least four other KL7 YLs for a total of eleven.
2. Endorsement stickers will be awarded to those amateurs holding PLSA upon proof of contact with each additional two paid-up PARKA members.
3. Operation on any authorized band, any authorized mode, cross-band not accepted.
4. Contacts valid from Feb. 1, 1955, forward
5. When sending confirmations, please enclos ficient U.S. postage or IRC's for return of and certificate.
6. Mail application and confirmation to KL7 Geraldine L. Nichols, Star Route A, Box Spenard, Alaska.

Here and There

From K6BX comes word that K5BNQ, YLRL's president for 1961, has received the cate Hunters' Club award and was the first show evidence of possessing over 50 a achievement awards. Other recent YL CHC ZS1RM, Margery, and K2UKQ, Kay . . special congratulations to Kay, K2UKQ, for ing *CQ's* Worked All Zones award. Of mor 1400 WAZ awards issued, K2UKQ is only th YL to achieve it.

"Howdy Days"

YLRL's get-acquainted contest, know "Howdy Days," was held in September. W6 Harryette, was the winner for having earn highest score for YLRL member and non-m YLs worked. Other YLs submitting logs sco this order: K4RNS, K5BNQ, K5YIB, W4HY W6DXI, WA6CCR, K8LHF, W1ZEN, K6 KØHEU, W5RFK/2, W7NJS, WA6EVU, KZ K1EKO, K1ADY.

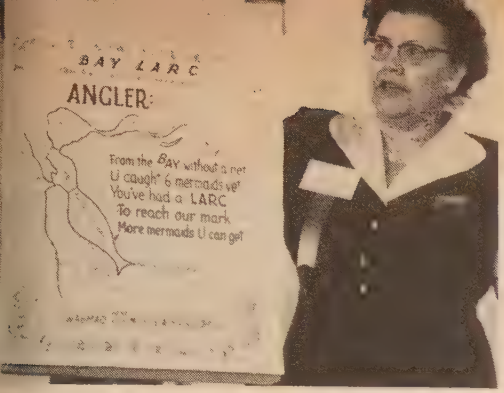
Photos, Anyone?

Enough words; your year-end new-year l all these photos we just haven't had space for ly. Now that we're caught up on those, how some new photos, gals and guys—indiv family, clubs, groups? All will be receive interest and we'll publish as many as possible

"CQ YL"

Santa didn't bring you a copy of *"CQ YL* and only book about the YLs? Maybe, thou did leave you that folding stuff with which a copy. 18 chapters, 500 photos, it covers all of YL participation in Ham radio. Order fro column editor (QTH at head of column), $3 paid.

33, W



W6BDE, Esther Given, who has served as BAYLARC president in 1960, displays a copy of this club's Mermaid Certificate. Rules for earning this appeared in Dec. CQ.

These members of the Loaded Clothes Line YL Net attended the Denver Hamfest this summer. L. to r., KØ's ADB, EVG, BTV, EDH and GAS. Tnx to LCLer KØEPE for the photo.

K9IXD, Doris "Butch" Singer, president of HAWK for 1960, has been reelected for another year. K9IXD is a v.h.f. enthusiast and handles traffic on 6 meters. She holds the BPL Medallion, her first BPL earned as a Novice on 80. Butch is Asst. EC for Marion Co., Ind. and N.C.S. for the Indianapolis AREC. OM W9SWD is Asst. Director for 9th area and SCM for Indiana, with Butch helping as secretary. K9IXD also is editor of the club paper, *Hawk's Eye View*.

These YLs attended the 13th Annual Hamvention at Grand Rapids, Mich.: K8LOK, W8ONI, W8ATB, K8KCD, W8ORP, W8WQE, K8HWC, KN8 Lenore, W8QOY, W8KLZ, W8VRH, K8DTD, K8QTG, W8HYO, W8SJF, K8KQH. Tnx to W8ONI for the photo. Her OM W8NXZ, by the way, won a complete S-Line station at the Hamvention.

At the Los Angeles YLRC installation-of-officers luncheon meeting K6ANG, Billie Blakesley, left, received the president's gavel from retiring president K6BUS, Midge Rommel. The gavel was made in Jerusalem of olive wood and was a gift to the club from W6QYL, Martha, ex-OD5CH.

Some of the many YLs attending the Breakfast Club picnic held at Palmyra in July. The net meets from 4 to 6:30 A.M. CST on 3873. L. to r., front row: W9HIX/4, K9AMD, K9UOT, K9QGR. Back row: K9's MWC, TNR, AMB, LTQ, LLA, KØTBV. K9QGR photo.

SURPLUS

by KEN GRAYSON, W2HE
Care of CQ 300 West 43rd Street,
N. Y. C. 36, N. Y.

We thought that we had seen everything in surplus, having completed three years on the *CQ* staff, but when we heard about the "Surplus of the Month Club," we began to have doubts. Seems that Dick Hinz, W6DIE, 833 Seventh Avenue, Sacramento 18, California has a clever idea and can give anyone who may be interested the full story upon request. You're probably not going to get an ART-13 or an ARC-5 every month in the mail but you never can tell. . . . "Surplus of the Month" . . . *gad!!!*

C. W. Xmitter For 20 or 10

While roaming around looking for new item... make popular via the column, we came upon ... little gem being sold by Barry Electronics ... apparently some others. We don't know what ... unit was designed for, although we can guess, ... it is built very well, and can serve as a c.w. tr... mitter for twenty or ten, or as a phone transm... for ten with very little change. The transmitt... fully self contained as far as the basic unit is ...

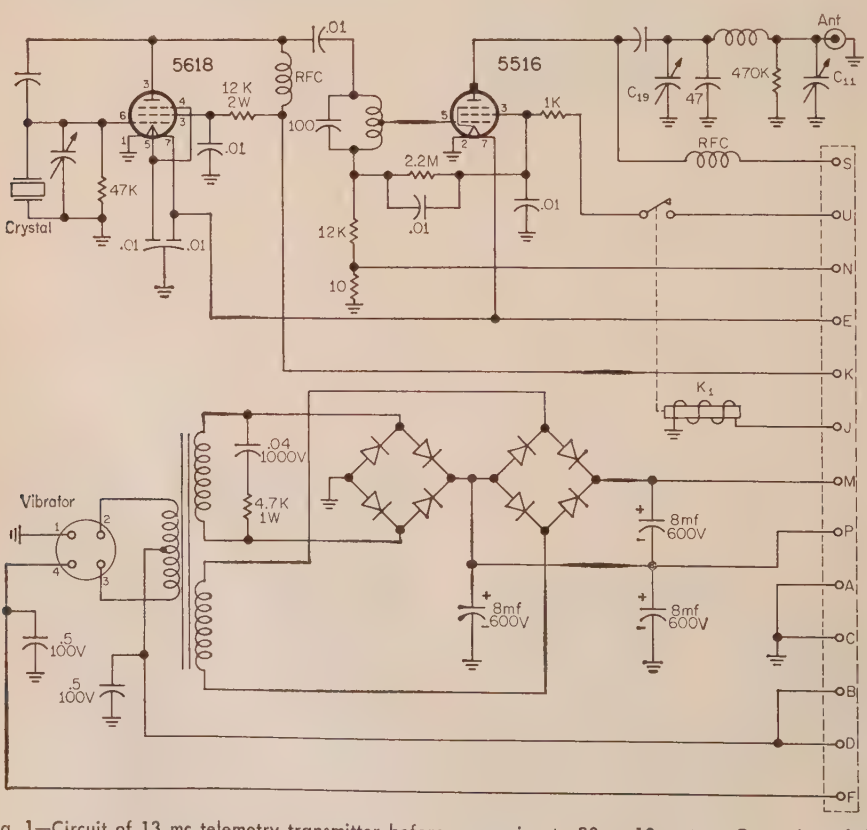


Fig. 1—Circuit of 13 mc telemetry transmitter before conversion to 20 or 10 meters. Operation of the unit is accomplished by connections between the various power plug pins as described in the text. Figures 2 and 3 show the power plug connections for modulation.

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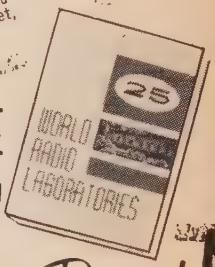

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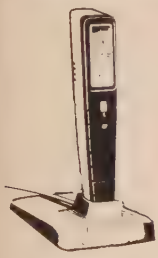

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For further information, check number 20, on page 126

cerned. Operating from 6 volts d.c., and using instant heating tubes, this unit was apparently used in some telemetering application, or perhaps for a weather balloon or such.

The power supply input is 6 volts, which is ideal for Volkswagons and other portable stations. The supply is the vibrator type and has two high voltage outputs which are connected in series to obtain the 300 volt and 450 volt outputs. Rectification is accomplished by means of silicon diodes in two bridges. All power and control voltages are fed in on a Continental type 18-16P connector and should use the 18-16S for a mate. These should cost a couple of dollars and can be eliminated by soldering directly to the appropriate pins, or by using another socket. Power normally comes in on pins *B* and *D* (six volts) with *A* and *C* grounded. Filaments are between ground and pin *E* (six volts) and the vibrator should have its coil returned to six volts by connecting pin *F* to pins *B* and *D*. All power from the vibrator supply must be connected to the transmitter by means of the power plug. Apparently some form of modulation was used, from an external device. Pin *S* should go to pin *M* (for plate modulation connect the modulator between these pins as described later.) Pin *K* and pin *U* should go to the 300 volt supply by connecting them to pin *P*. When plate and screen modulating the unit, a different connection is used and this will also be described later. Keying is accomplished by connecting pin *J* to the 6 volt line, a relay serving to switch screen voltage on and off, (fig. 1).

The output tube is a 5516, which is an instant heating power pentode. The oscillator is also an instant heating tube, a type 5518, which is very similar to a type 2E30 instant heating tube, or a 6AQ5 in basic characteristics. The circuit of the unit we obtained uses a 13 *mc* crystal and drives the output circuit at 13 *mc* at about ten watts. For twenty meter operation all that is necessary is to reduce the size of the capacitor across the grid coil to about 68 *mmf*. For ten meter operation several changes will be necessary. An overtone crystal should be used with its output at ten meters directly. The grid tuning capacitor should be reduced to about ten *mmf*, or a 7-47 *mmf* trimmer could be used to set the exact frequency, since the slug will have very little range. The final amplifier is used straight through, and uses a very good quality glass tubular trimmer shunted with about a 47 *mmf* mica. For twenty meters this should be left alone, as the final tank, which incidentally is a Pi network, will tune the band. For ten meters, this should be removed, since the trimmer seems to be enough capacity for the band. No tuners should be removed from the final tank coil for twenty meters, but for ten meters all but six turns should be removed at the output end of the tank circuit.

Since the characteristics of the power supply were unknown, it was decided to make use of a clamp tube modulator, since this requires the least amount of current expenditure from the supply. Figure 2 shows the circuit using a 6AQ5. The instant heating effect of the circuit is somewhat dis-

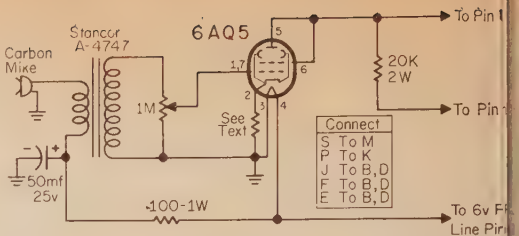

Fig. 2—A clamp tube modulator for the telemetry transmitter. Power connections should be made as shown in table.

pensed with, but it does provide cheap modulati The cathode resistor should be adjusted to br the screen voltage to about 250 volts and will somewhere between 500 and 2500 ohms. A sin transformer provides enough gain with a carb mike to provide adequate modulation. A separ plate modulator could be used if desired and could be connected as shown in fig. 3.

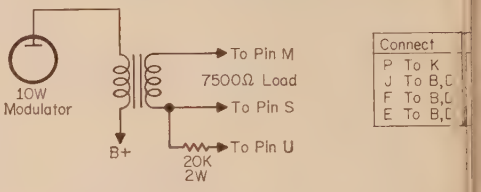

Fig. 3—Power plug connections for plate modulating the 13 mc telemetry transmitter.

Tuning

Tuning up is relatively simple. With power c nections set as shown in fig. 2 and 3, apply pow With a 1 *ma* meter connected with positive ground and negative at pin *N* adjust the grid ta either by the slug, the added trimmer, or both maximum grid current. Now, with a 100 *ma* me in the plate circuit, with the negative lead at pi and the positive lead going to pin *M* or to modulation transformer (to complete the circu adjust the plate trimmer for a dip and incre the loading with the ceramic compression trimm (with the antenna connected of course). Re the plate and peak the loading and you are on air. Rated plate current is about 65 ma.

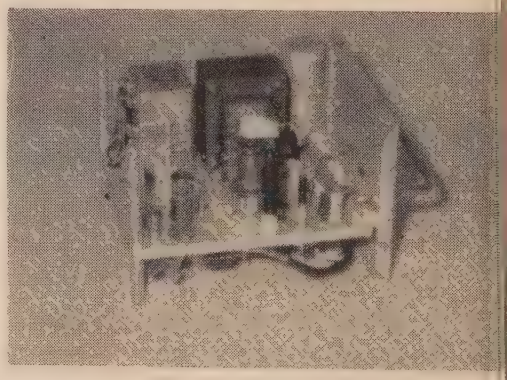

Photo showing vibrator power supply (rear), 5618 crystal oscillator (front left), and 5516 final amplifier (center).

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HIGHLIGHTS: Transmitter power input 100 watts AM, 120 watts CW • pi network output for 52 ohms • Dual conversion receiver • BFO for CW/SSB reception • Automatic noise limiter • Sensitivity: approx. 1 microvolt at 50 ohms for 6 db S+N/N ratio • Selectivity: 3 to 3.5 kc bandwidth at 6 db down, 14 kcs or less at 60 db down.

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For further information, check number 21, on page 126

6 to 12 Volt Conversion

An investigation is being made to the use of a Mallory 1701 vibrator (or its equivalent) which will allow the power supply to be used directly on 12 volts without any change of transformer and with only a minimum of wiring change. Full details will be available next month. This technique, by the way, is applicable to other six volt equipment.

Surplus News

There has been an increase in new types of surplus lately, especially in the IFF equipment (see *QST* Sept. 1960) and the other UHF equipment for the 1215 *mc* band. The quality of this equipment is excellent and far surpasses anything that came out of W.W.II up to now. The increase of the Navy surplus will make a big dent in the two meter band with the TDQ equipment being a full 150 watts (input) completely self contained. About the size of a small ice box, this is quite a unit. The URC-4 handy-talkie is a two band job, 2 and 1¼ meters, and built like a battleship.

Metro Electronics (74 Cortlandt St. NY 7, N.Y.) still has the speaker squelch units we described a while back for four bucks postpaid.

For those who don't have it, drop Meshna a line at 580 Lynn St., Malden, Mass., for his catalog—quite a revelation in prices. In the Philadelphia area, Selectronics at 1206-18 Napa St. has a few real good buys, and Spera Electronics in L.I.C., N.Y. shouldn't be overlooked if you are on TV or teletype.

When it comes to clean equipment, Algeradio in Hempstead, L.I., N.Y. has some beautiful buys in test equipment and parts. And don't forget Fair Radio Sales who just moved to 2133 Elida Road, Lima, Ohio, and their fantastic buy of the ARC-3 equipment for twenty bucks for a terrific two meter receiver.

Mail

Lowell Otto, 4743 Galahad Dr., New Orleans, La. is in need of a handbook or schematic on the RCH Navy Receiver. D. B. Peters, 480 North St., Babylon, L.I., N.Y. needs a conversion or schematic of the AM-913/TRC plug-in. Tommy Darsey, 208 3rd Avenue, Meridian, Mississippi needs a schematic or handbook on the AM-18/APT. Jim Long, 614 North Howard Circle, Tarboro, N.C., asks for information on the BC-442A antenna relay. David McKenzie, 406 South Main St., Leon, Iowa is looking for a conversion of the SCR-284, (BC-654A). Anyone who converted a Navy REB panoramic adapter to 455 kc IF should contact Roger K. Thompson, 9834 116 Avenue S.E. Renton, Washington. Ed Lake, 1930 Ottawa Beach Road, Holland, Michigan needs data on the BC-1066 for his Scout troop. Alex Cole, 111 West Tilden, Roswell, New Mexico needs parts and information for a TG-10-D keyer. John Wagner, 11085 4th Street, Treasure Island 6, Fla. got a military model of the Ampex S-3560 and needs the handbook. Stephen Collins VE6ADI, 15036 85 Avenue, Edmonton, Alberta, Canada has a conversion problem on an AM 293B/UPX and would like some help. Henry Pierce Box 118, Meadowv 4, Fla. needs information on an ART-13 cry calibrator.

F. B. Childs, 1944 Portland, St. Paul 4, Mi needs a handbook or schematic for the APX-6 APG-15 equipments. Charles O'Gara, 67 Grin Ave., Tinerton, R.I., needs a handbook for BC-654 and the TCS equipment. G. J. Gus 4901 Outlook, Mission, Kans., wants a ma for the ART-13 equipment. Ward E. Deave, I 182, Martin, Mich., needs a conversion and m ual for the BC-923.

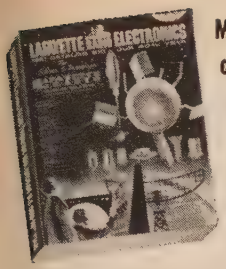
Raymond Locke, Marist College and Semina Framingham Center, Mass. needs a BN-1 Ma and conversion, while Lawrence Kazmerski, the Passionist Fathers, Warrenton, Missouri is need of manuals for the TCS, ARC-5, TCE-2 the PP-4/APQ2. G. J. Gustke, 4901 Outlook, M sion, Kansas needs a manual on the AN/ART (Navy Model ATC). Johnie Thorn wants ha books and conversion data on the RU-16 receiv his address is 5331 Lee Highway, Arlington, V ginia. Austin Wade, 406 Avery Road, Omaha Nebraska needs any information available on ID-76/CPS-1, and on the IP-223/ALA-5. Bo Kea 5713 Kentucky Avenue, Altoona, Pa. needs manual for the NC-125.

Tom Claeys, Mounted Route 2, Davenport, Io needs a book for the RT-220/ARN-21. Ro Thomsen, 9834 Avenue S.E., Renton, Washing needs conversion and books on the REB panada Alvey Pittman, 2555 W. 71 St., Indianapolis Indiana needs a BC-348J handbook. Bob Ba 2939 South Smedley St., Philadelphia 45, Pa operating info for the DY-12/ART-13 dynamo and how to use it with the ART-13. Joseph Sza c/o Szabat Funeral Home, 228 Plummer St., City, Pa. would like to have a conversion and sc matic for the BC-950 (T-23/ARC-5 transmitter 2 meters with built in modulator).

Paul Simandl, Rt. 7, Green Bay, Wisconsin wa to get hold of a manual for the Navy TCB-2 C lins transmitter. Stanley Chichy, RD-1, Burnt Hi N. Y. is searching for a manual on the TS- (part of the AN/CPA-8), and can use any h on that equipment. Norman Troudt, 1501 Wo land St., Beatrice, Nebraska needs conversion h and schematics for the BC-923A, as does W E. Deane, Box 182, Martin, Michigan. Bill Chris anse, c/o Thornton Township High School, 1 St. and Broadway Avenue, Harvey, Illinois, wa help in locating information on the B-19 MK transceiver. Dick Martin, 15 Gates Road, Che Point, North Carolina wants TBY-8 and AN/ARC manuals. Douglas Mitchell, 110 Halley Street, S Francisco 14, California needs a BC-604 Manu Charles O'Gara, 67 Grinnell Avenue, Tiverton, R needs BC-654 and TCS manuals.

At *CQ*, your editor needs a manual for AN/ARC-4, ART-13, APX-6 BC-923, ARC-5 VH ARC-1 and ARC-3 equipments. We will pay posta but please drop a card first to let us know w you have. Chances are that several books may t up and we only need one of each. All cards will answered.

73, Ken, W2HD



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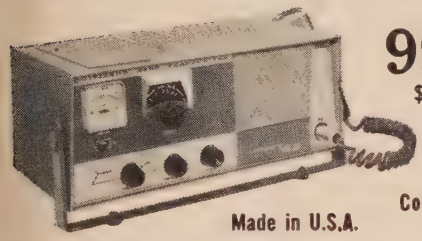

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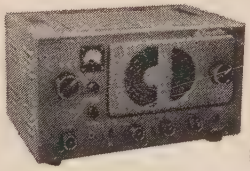

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ANNOUNCEMENTS [from page 14]

Kishwaukee Radio Club

The Kishwaukee Radio Club of DeKalb, Illinois has just completed its first meeting of the fall season. Ed Grey, K9SLM who is handling the correspondence for the club informs us that the second Monday of each month is the day the gang gets together at the DeKalb High School. A Novice class is being formed for those interested in obtaining their license. K9SLM's QTH is Evergreen Park, Route 64, Sycamore, Illinois.

East Coast V.h.f. Society Inc.

The East Coast V.h.f. Society Inc. will again entertain its members and many friends at their 3rd Annual Dinner and Hamfest to be held Saturday, February 25th at Neptune's Inn, located near River Edge, N. J. on Route 4, starting at 7:00 P.M.

An entertaining program has been arranged to include installation of new officers; presentation of awards to members of our society and to other distinguished radio amateurs; speakers of note; novel entertainment; door prizes, etc.; all topped off with plenty of unusually good food.

Tickets are priced at $5.00 per person and are available from any member of the society, or by writing: Roy King, K2BNQ, 55 Woodland Avenue, Montvale, New Jersey.

Ticket deadline is Sunday, February 12th and no tickets will be sold at the door. Requests from other radio clubs for specific groupings will receive special attention, if such orders are received early by K2BNQ. Requests of this nature can be honored only for blocks of five (5) or more tickets. Motel accommodations are available nearby for out-of-town visitors.

The Society, well known in amateur radio circles for its hospitality, once again extends a warm invitation to young and old alike with a hearty "See You At River Edge."

Delaware-Lehigh A.R.C.

At the recent annual banquet held by the Delaware-Lehigh Amateur Radio Club the following officers were installed: W3SAP, President, W3NNT, Vice president, W3MAZ, Secretary and W3DVF, Treasurer.

W3FKE and W3GFA were presented meritorious service awards for their part in conducting code and theory classes weekly at the Club.

The club project is rolling in high gear, which is the building of transmitting and receiving gear for 420 mc with the ultimate idea of establishing a local net.

More information regarding the D.L.A.R.C. may be obtained by writing George A. Keller, W3EVY at 1340 Easton Ave., Bethlehem, Pa.

Palo Alto Amateurs Visit Ampex

Members of the Palo Alto Amateur Radio Association of Palo Alto, California toured the plant of Ampex Professional Products Company as a feature of their November 4 meeting. In addition to the tour of the Ampex facilities at Redwood City, Calif., the Palo Alto hams heard a talk by William Barnhart, Ampex manager of video custom products, and saw a demonstration of the Videotape® television recorder.

Tropical Hamboree

The Dade Radio Club, Inc. has announced their 1961 Tropical Hamboree which will take place at the Bayfront Park Convention Auditorium in Miami, Florida on January 14 and 15, 1961. The Biscayne Terrace Hotel, one block from the auditorium has been designated as "Headquarters" for out-of-town guests.

Thirty big booths will be full of the latest receivers, transmitters, antennas, towers and other ham gear.

In the Auditorium from 9:30 A.M. to 5 P.M. each day: Contests, techtalks, forums, and a typical Florida-style ham auction. "Early Bird" prizes (tri-band beams) each morning, for which the winner *must* be present. Door prizes every hour. Winners names will be posted and prizes claimed before the Sunday after-

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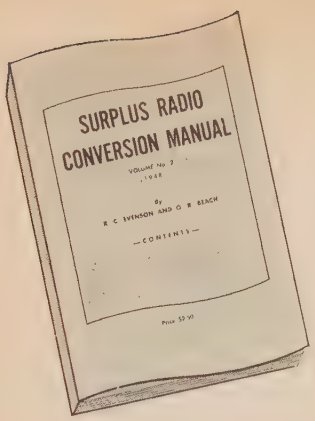

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Hamboree registration $1.00. Registration be... January 1*st* will include an extra ticket for a gu... and/or door prizes.

Tickets may be obtained from members of the D... Radio Club, local ham distributors, or by writing ... Box 104, Miami 1, Florida.

CQ CONTEST [*from page 57*]

frequency—CQ Contest, CQ Contest—aha—s... body calling me! A phone patch? In the midd... a contest? Your mother-in-law is sick and you ... to find out how bad? Look friend, it's only ten ... from New Jersey to New York! I'll send yo... money—call on the phone! How about a numbe... if the F.C.C. heard that, you'd be using the ... permanently!

1714—CQ Contest, CQ Contest—K5ZZZ y... 59017—oops, sorry we've already worked—h... you doing, old man? 108? 72 multipliers? Wa... do—count them once for each ear? 73's and ... luck! (Your mother's here? That's nice!) CQ ... test, CQ Contest—(just leave the can opener ... I'll manage with the beans—I've got experie... CQ Contest, CQ Contest—(who says I'm goi... to dinner—if your mother's hungry, give her th... opener!) Shhhhh—he's calling ME—he's c... MEEE—W5 SSS, you're 59018, thanks for ... 59119—at last a solid contact! Somebody out ... hears me! (For the last time, this is *THE* conte... I'm not going out for dinner!) CQ Contest ... Contest——Wow, an F7 on my frequency—q... before the pack finds him! F7BT, F7BT, this ... —, over! F7BT, F7BT, here is K2——, Copy? ... QRM—move down 5—down 5! I will look fo...

[*Continued on page 110*]

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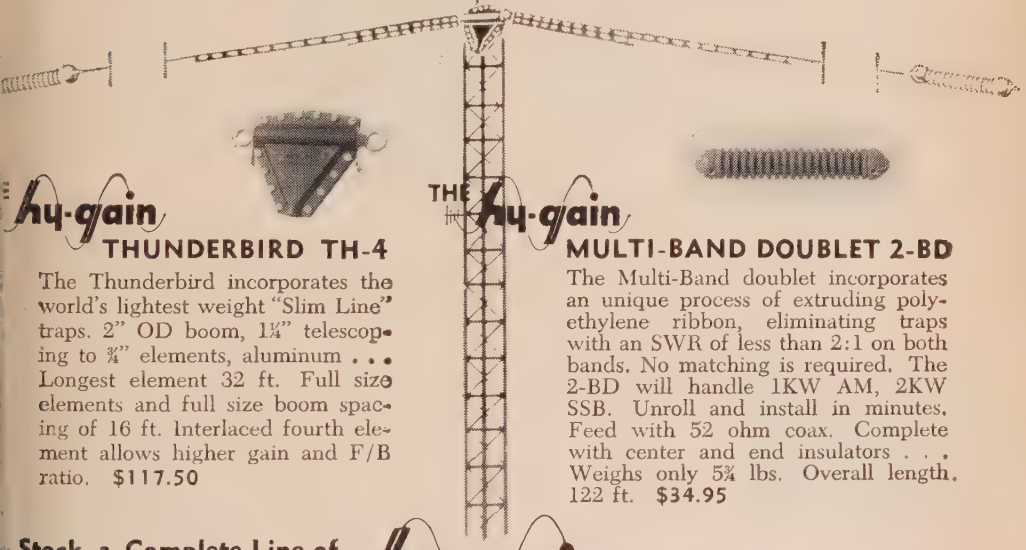

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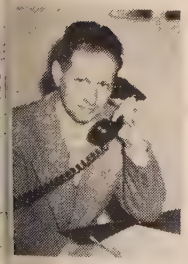

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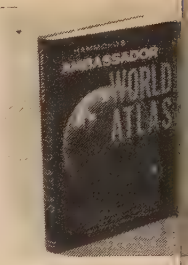

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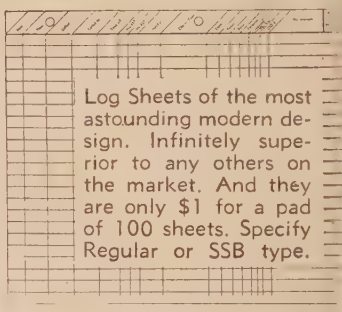

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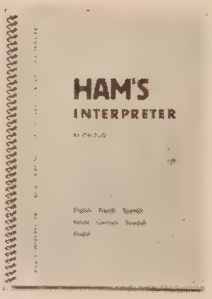

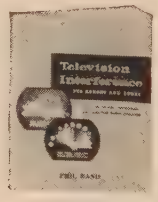

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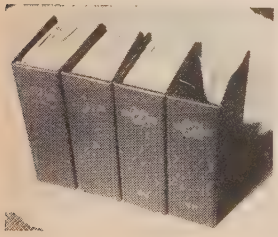

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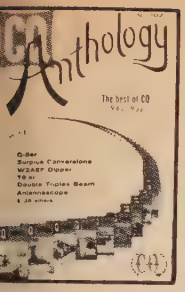

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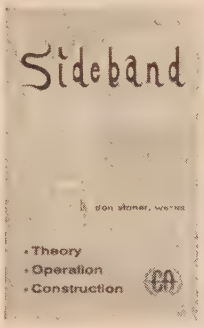

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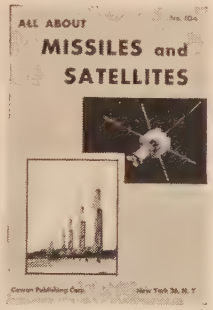

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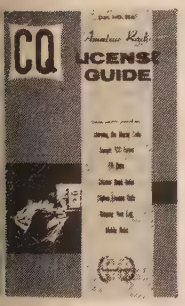

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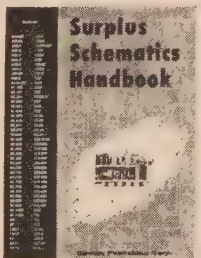

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  - **—Ionospheric Sounder Operations**
  - **—RDF Systems**
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  - **—Amateur Radio Enthusiast**
- FCC License, 1st or 2nd Class.

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ACF INDUSTRIES
INCORPORATED

RIVERDALE, MARYLAND

there—do you roger? Okay, Okay, I hear you fin what's my report? What's that? QRM? Move d 10? F7BT, F7BT, here is K2——, over! Didn't the whole report—you're 59020, over. F7BT, F7 are you there? (For goodness sake, stop throw things—I'm not going out!) Now where did he F7BT, F7BT this is K2——, are you there? W you've got to QRTnow? But my report? Oh n he's gone! (I will not "cease and desist"—this t goes on until tomorrow—take you hands of swit————)

DX [*from page 63*]

c.w. around 18-19 GMT—Don't pass up any U if you don't already have one, very good new c try possibility—FF8CK, Senegal, active on 21 kc around 18 GMT—FQ8HI on 21 mc a.m. FQ8HW on 14 mc c.w. keeping new Tschad Re lic active—KC6AQ, Western Carolines, s KG6NAB Thursdays, on 1130 GMT on 14265 s.s.b.—LA2DE/P a new one on Spitzber LA1LG/P new on Jan Mayen—VR4CW a again on 14020 around 0835 GMT—ZC5A VS6EE active on 14095 kc around 11-15 G ZL1AV can help with skeds—All Korean Natio are now HM. G.I. will continue to use HL9—J now back in OK land. Others active are JT1's, AW, KAA, KAB, and KAC—Received a sto the ZE3JO/ZE3JJ DXpedition to DZ6 land j little too late to put in this column, but will hav full story next month—My good friend, Ken, E will leave on vacation to the East Coast of the around the first of April so get your cards to before then. Ken offers to show his films and s (he's an ex pro-photographer) to any interest g while he is stateside—The choice ones at K2TL clude CR5MA, VR3L, VS1JV, 9N1CJ, 9M HV1CN, UL7JA, and FF4AK, all on s.s.b.

QTH's

FQ8HO	via K6EC	VQ4RF	via W4MC
FY7YI	after Nov. 1, 1960 via W3AYD	VQ9A	via W4TO
		ex VR1F	17 St. All
ex OQ5IE	now ON4AD		Ave., Mo
PZ1AX	via W2CTN		Eden, Auc
SVØWZ	via W7FTU		New Zeal
VP2DU	after Oct. 1, 1960 via W3AYD	VR4CW	Box 49 Hd Guadalcan
VP5AB	after March 1, 1960 via W3AYD	ZS1RM/8	Solomon I via K2QX
VQ2AB	via W6ZAF	9Q5YM	via W8TM

That's about it for this month. Have a H New Year with lots of good DX.

73, Urb W2

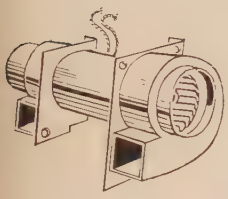
NOVICE [*from page 68*]

KN7KPT, KXG, LHE, LPF, LPY, LSM, MDS, MEG, NGO, NNX, KN8LMJ, RHV, SBU, TDF, TLX, UGL, KN9AIB/9, VW WMH, WYI, YDH, YMI, YNI, YNU, ZHN/9, ZLF, KWH, KNØ, *ALX*, DDT, YET.

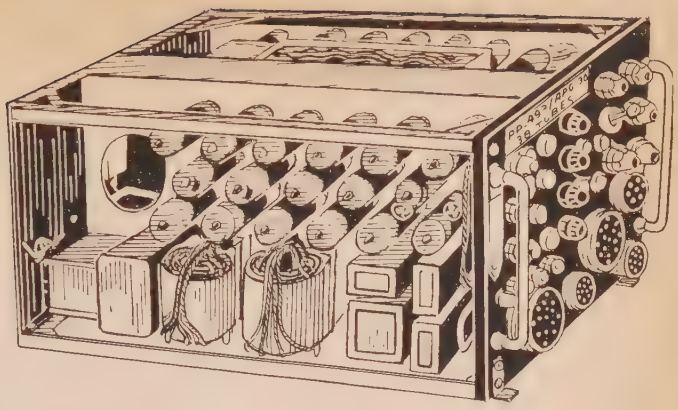
Help Wanted

W2—Bruce P. Tis, 42 Motley St., Malverne, York LY 9-6251

38 Tube Aircraft Electronic Gun Control



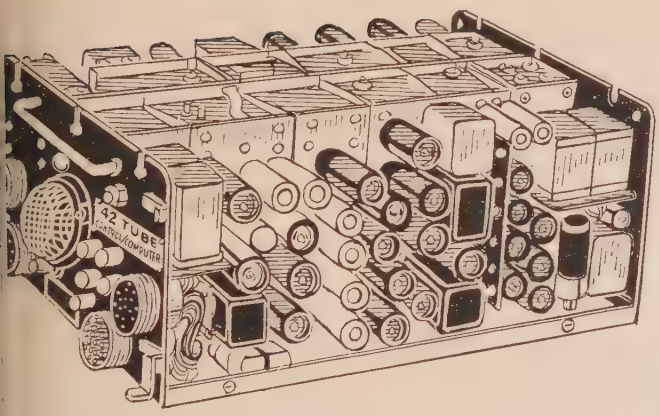
(BLOWER)



Unit contains many precision parts for the experimeter. Tubes include: (1) 0A2, (1) 2D21, (1) 6AQ5, (2) 6AH6, (1) 6AS6, (2) 6J6, (5), 6X4W, (2) 12AT7, (5) 12AX7, (2) 5654, (4) 5670, (1) 5725, (3) 5726, (8) 6005/6AQ5W. Parts include (6) tube 30 Mc. I. F. Strip. 28 VAC or DC dual squirrel cage blower with R. F. filter, (5) hermetically sealed relays, (11) potentiometers, (5) BNC chassis connectors, 5 & 10% Allen Bradley resistors. Metallized paper capacitors, silver mica capacitors, 1% precision resistors and many other parts too numerous to mention. Good used condition. Furnished complete with removable cover.

Type #PP493/APG30. Size: 8⅜"H x 10-5/16"W x 16½"D. Wt: 35 lbs. Cat. #4-APG3. **$15.95**

FOB, Georgia or NYC.



42 Tube Control-Computer

If both the 42 Tube Control/Computer and 38 Tube Aircraft Electronic Gun Control units are ordered, both units can be shipped for the same low, low economical motor truck for the 100 lb. wt. minimum.

extremely compact and modern unit consists of 42 late-type ature tubes and components. At a very modest cost you get a fall of useful parts. Ideal for the modern experimenter or R & D

has following tubes: (3) 5687, (1) 6J6, (14) 12AT7, (10) W, (4) 12AU7, (2) 6AH6, (3) 12AY7, (2) 12AX7 (1) 6AK6, 6AS6. In addition, unit has (10) compact hermetically-sealed s, (10) each "BNC" Type Panel Coax connectors, more than "Pots" and several Delay Lines. You also get over (100) Mica itors, and over (100) Resistors, plus 42 Miniature Tube Sockets tite Type) with copper Berellium contacts. Sockets are finest type which cost Gvt. over $1.00 each. These sockets are excellent for "low-loss" VHF use. Most tubes come with modern heat-leak shields. Interesting, plug in, sectionalized construction. (4 Basic units). Units are in good condition, removed from equipment, complete with all tubes. There are many, many other useful and valuable components such as connectors, blower, xfmrs, Vitamin Q Capacitors, etc., etc. This unit is one of the best values we have advertised in some time. Wt.: 28 lbs.—Size: 7½"H x 10"W x 17½"D. Furnished complete with removable cover. (Gvt. cost $1068.00 each). Tubes alone worth almost twice our low price of **$19.95**

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NAME

TITLE

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CITY STATE

COMPANY AFFILIATED WITH

For further information, check number 27, on page 126

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BC-659	transceiver — 27 to 38.9 mcs.		10.95
BC603	receiver, new w/tubes 15.00—as-is	1/tubes	5.00
BC604	transmitter w/tubes, 20-27.9 mcs	new	8.50
BC458	transmitter 5.3 — 7 mcs.	new	5.00
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BC312	receiver, 6-band, 1.5-18 mcs.		69.50
DM21	dyn. 12 v dc u/w BC-312		5.95
PE120	or PE117 vib. power supply u/w BC-659,-620		3.45
PE103	dynamotor 12V, new 14.50	exc.	12.50
BD77	dyn. 12V to 1000V @ 350 ma	exc.	9.95
DM34	dyn. 12V to 220 dc @ 80 ma.	new	5.00
MP-22	mast base for mobile mount	new	1.95
T-26	mobile chest mike 5/3.00	new	1.00
5F or 5G	Synchro motor, genr. 115V, 60cps.	new	15.00
DY-17	dynamotor 27 vds. to 750 @ 350 ma	1/new	12.95
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All prices fob Linden, N. J.

For further information, check number 28, on page 126

For further information, check number 29, on page 126

Letters

From the home state, WV6MLI, Dick Gi 13716 Angola St., Whittier, Calif., writes to sho his beautiful home-grown photographic QSL (re duced hereabouts). Dick has a WAS of 43/36 will sked for any reason.

KN9YJQ, Al Bogdon, 5546 So. Nottingham A Chicago 38, Ill., is a 40 year old youngster and joys ham radio very much. Al exclaims the No license period is a very good thing for prepa for the General license, which he hopes to go soon. During five months of operation, Al snagged 30 states, with 27 confirmed, and he h to get on 15 soon to pick up his first DX this wi

KN1MVK (Mother's Vicious Kid), Pete H 11 Edelweiss Lane, Darien, Conn., cranks on w home brew 6146 rig running 75 watts, an SX into a one element rotary on 15. Pete hopes t v.h.f. soon.

Bob Gaines, Jr., K4SUN, 120 Roszel Road, chester, Va., bids fond adieu to the Novice r after pocketing his General ticket. Bob finishe with a WAS of 44/42, a DXCC of 18/12, WAC of 5/5. He would still like skeds on any with the following states; Nev., Vt., Wyo., Id N. Dakota and Alaska. Bob plans on keepin Ranger transmitter, for he still prefers "CH William," but hopes for a new receiver and be

If you're wondering where all the letters don't blame me gents! It's your fault! As so you sign AR tonight, take pen-in-hand and z a line to Tango-Nectar-Sierra and give me the Ma'am, (or Sir, as the case may be). Don't f to send a snap of the station. If you haven't e your Novice ticket yet, screw up your courag zip off a postal card with your name, address phone number, for the "help wanted" sectio won't hurt a bit—honest! For now . . .

73, De Don, W

CONTEST CALENDAR [*from page 65*]

3. Final score: Total points multiplied by multiplier.

4. Sample log—NR 1 W2EQS 579 NJ.

5. Awards: A most attractive certificate to th station in each State, Canadian province and fo country.

Your logs should be postmarked no later March 15th and go to: *CQ*, Att: 160 Contest West 43rd Street, New York 36, N.Y.

YLRL YL/OM

Phone

Starts: 1.00 P.M. EST Saturday, February 2
Ends: 12.00 M. EST Sunday, February 26

C.W.

Starts: 1.00 P.M. EST Saturday, March 11t
Ends: 12.00 M. EST Sunday, March 12t

This is the 12th Annual YL/OM contest an be fully covered by Louisa Sando, W5RZJ, February YL Column.

get **SHURE** quality & dependability in a completely equipped SSB MICROPHONE for less than $30

- Complete With Grip-To-Talk Switch, Desk Stand, 2-Conductor Shielded Cable.
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For further information, check number 30, on page 126

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Model 65B—130 lbs. net

For further information, check number 31, on page 126

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Never hesitate! Our job is to counsel as well as sell. As Northern New England's largest distributor we'll help you select new or reconditioned equipment. Our sales are backed by our engineering department — no need to return equipment to factory for repairs. Come to us, we will meet your purpose as well as your purse.

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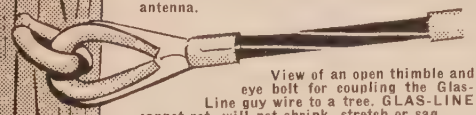
NON-METALLIC GUY LINE – PERFECT FLEXIBLE INSULATOR – REVOLUTIONIZES HAM RADIO & TV ANTENNA SYSTEMS

Non-inductive, non-conducting, non-absorbing Glas-Line isolates systems from directional arrays, rhombics, etc.

The new main insulator of W3UCT. The Glas-Line is between the two egg insulators running to the lower left. The copper link between the center egg insulator and the upper right egg insulator is for the dead-end feeder of a Zepp antenna.



View of an open thimble and eye bolt for coupling the Glas-Line guy wire to a tree. GLAS-LINE cannot rot, will not shrink, stretch or sag . . . has high breaking strength of over 500 pounds with proper use.

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Announcing New "G-3 50X GLAS-LINE CABLE" with 2,500 lb. TENSILE STRENGTH with proper use.

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BC-603 CONVERSION

BC-603 Conversion article (Sept. & Oct., 1958 CQ) Reprints available at 50¢ per set.

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Editor's Note

The scores on the Phone logs being received l definitely lower than those of the past few ye reflecting the unusually poor conditions we countered. Of the few European logs receive date, little or no US contacts were noted, but t evidently had a gay time between themselves.

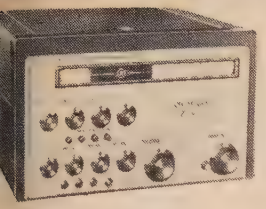
George, W3ASK better come up with a be forecast for the c.w. section. Two lousy week-e would be just too much.

73 for now, Frank, W1

SB [*from page 88*]

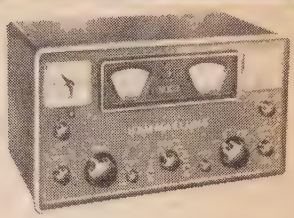
brother, Terry, VQ5FS. Vinnie wrote that it t quite a bit of persuading to get him away from addiction to a.m. but he is now convinced of folly of his ways! . . . Another recent convert (one of whom we are particularly proud) is Ov W6YWJ. Owen, who also took quite a bit of vincing, now admits that sideband has given hi new lease on amateur radio . . . In sending for "Worked 100" certificate, Lou W3COG, noted he had been hamming for 29 years and never the DX fever until five months before he app for the award. In that short time, and "without due loss of sleep," Lou managed to work 105 get the necessary confirmations . . . Chet, ex-F7 is now W4IH/6, affiliated with the Hoffman E tronics Corp. in Los Angeles. We wish him e success in this new endeavor . . . Uncledave, APF, has asked us to announce that anyone i ested in the Freedom Network and its future ations, please contact him without delay as c mittees are being set up around the world . . . goes to show you what careful alignment of can do for a signal—Barry, WA2BIT, who 17-year-old newcomer to amateur radio, has on the best sounding SB-10 rigs we have ever h on the air. When asked how he got such a fine nal when others have failed, Barry confided tha had spent days and days aligning his rig un worked to his satisfaction. Wish more opera would follow Barry's example! . . . We heard in 21 months on s.s.b., Rial, K7GRU, made 15 contacts. It's not too hard to believe after hea the fine signal that Rial puts out from Phoe Ariz. . . . John, W2ESZ, is writing a book on a concept called *The Mathematics of General* Although we listened with intense interest to Jo explanation in the wee small hours one morn the concept was a little too lofty for our imm ate understanding and we are eagerly looking ward to the publishing of his book so that we pursue it further . . . It was a delight to meet T K8PXX, whose son is K8PXW and whose OM i KN8PXY. We hope that OM Bob can now find time to get at least his technician's license to the progression of calls in the family will no disturbed . . . Heartiest congratulations to Jo KØIKL, and Art, VE1EG/WØ who became proud parents of Jeanette Louise in November Here's food for thought: when an a.m. station *CQ* in the sideband portion of the band or whe answers your s.s.b. *CQ*, it gives you a wond

FOR THE TOP DEAL ON HAMMARLUND
Write or Call, W9GRF, Fred



HX500 $695

HQ170 $359



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Low interest easy terms available.

A & F ELECTRO MART
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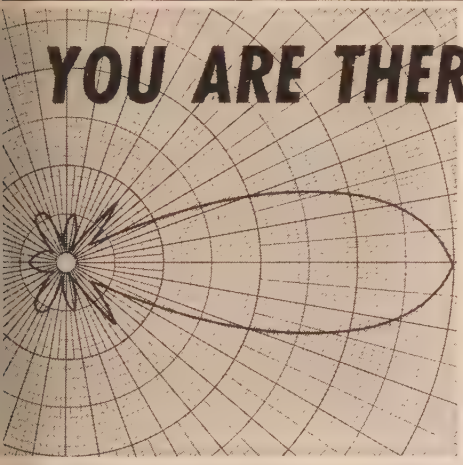
Milwaukee 14, Wisconsin
Phone GLenview 3-0980

For further information, check number 34, on page 126



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Converter Transistors and parametric diode	$10.00
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Mini-Modulator Transistor Set	$ 2.00
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Complete Set, With Instructions, Postage Paid	$29.95

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Recent promotions have created openings for qualified project engineers with experience in the design and development of amateur radio products. The men we are seeking have these qualifications:

- College degree or equivalent, 3 to 5 years experience with engineering design of communications equipment, preferably amateur radio.
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- Active, licensed hams preferred.
- Excellent salary, liberal benefits program, ideal working conditions in a modern plant on the shores of Lake Michigan.

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Benton Harbor, Michigan

opportunity to do a little public relations work
have a chat with him, the point of which will
ally turn to the merits of sideband. We may b
quick to believe that an a.m. station in "our
tion" is there only to cause QRM when, in trut
may be interested in learning more about sidel

At this festive season of the year, we wish
and yours all the good things you deserve and
with you a hope for peace, prosperity, and
health in the year ahead.

73, Irv and Do

RTTY [*from page 95*]

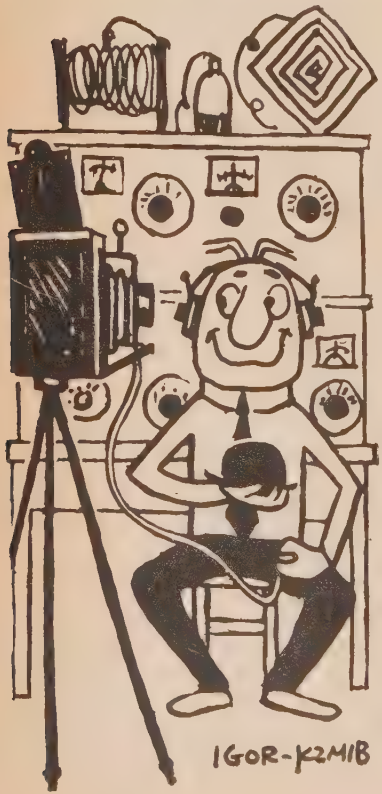
tion, such as, "A Local Loop Constant-Cu
Regulator," by W7WJ; "Better Filter," by W
and "A Simple TU," by W7RCL.

Members include K7JAX, W7IAM, W
W7KBO, W7WJ, W7WWG, K7CTC, K7
W7LI, W7RCL, W7AOI, K7KRE, W7O
K7DVK, W7DGA, and visitor W7FEN.

Across the Nation

A letter from W8TIF says, ". . . you ment
that Rhode Island no longer had an RTTY stati
When I was stationed at Quonset Point I mad
acquaintance of one Stan Butryn, K1MAM,
Kingston, who is *very* active on RTTY, primar
40 and 20 . . . Stan runs an SSB-100-MIL i
4-1000A. His receiver is a 75A-4, and machin

[*Continued on page 118*]



ARMCHAIR PHOTOGRAPHE

In this hectic era of space stations and amphibious autos, far
from us to criticize progress. And yet, we shake our cranium
sadly, and we reminisce a bit remorsefully to the days not so
ago when we hadn't yet traded our souls for do-it-yourself
And looking back, we remember when the pioneer of the
yourself phaze was the died-in-the-wool ham who built and se
his own station.

Even so, we must force a faint smile as we remember that eve
true-blue old timer occasionally referred to *CQ* to solve a
problem or refresh his memory on a technical point.

Mind you, we're not opposed to progress. We just realize that
are so many new phases of our hobby being developed toda
CQ has become a second right arm to its regular readers. And
hams who only occasionally happen to browse through a co
CQ . . . oh, well! Some hams still like to do things the hard

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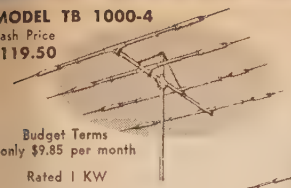

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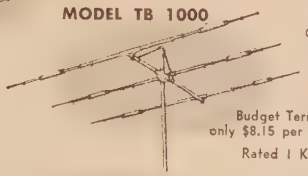

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CITY _____ STATE _____

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For further information, check number 38, on page 126

WOBBULATORS [*from page 45*]

onic must, of course, fall in a band covered by e receiver. When the signal is entering only rough the antenna lead, it will disappear when e receiver is tuned. If the signal is feeding rectly into the *if*, tuning the receiver dial will ıve no effect on the signal.

If the *if* strip has no front end ahead of it, e wobbulator may be set to 222 *kc* or 152 *kc* rmonic fed into the strip in a norma lmanner. ıis latter system has been used to align exciter ter strips, with considerable success. In this se a temporary diode, or *rf* probe, was con-cted to the output of the filter amplifier.

The time-base level control should be adjusted give only the required shift. The greater the rmonic fed into the strip in a normal manner. viation. The time-base oscillator in the 'scope *ust* be set to a low frequency. It must be high ough to pass through the vertical amplifiers, t low enough to prevent ringing at the leading d lagging edges of a steep *if* bandpass. If the :quency is too slow, the picture will not be a ıe representation of the actually bandpass ape due to the slow charge and discharge time the amplifier coupling capacitors in the 'scope. tween 30 and 50 cycles per second is a good mpromise.

The above data assumes that the receiver *agc* turned off and the *rf* gain control backed off sufficiently to prevent overload of the *if* channel. *Overload may give a deceptively flat-topped bandpass.*

If it is desired to look at the sidelobes, say 30 *db* down, we must use some form of compression in either the receiver or the 'scope amplifier. The smallest picture that may be seen on the 'scope must, of course, be larger than the thickness of the trace and 30 *db* down is 1,000 times! A thousand times the trace thickness is a lot of inches and will normally take the trace right off the screen. It is possible to turn the 'scope gain up until compression takes place. The trace can then be centered for observation about the base-line.

The receiver *agc* may also be used to compress the signal, enabling sidelobes more than 40 *db* down to be clearly seen. The *agc*, however, must be fast enough to follow the signal; this may mean that large *agc* capacitors may need replacement with smaller values to allow a satisfactory *agc* time constant. These capacitors can be removed when the alignment is complete.

Aligning filters with this wobbulator certainly makes a difficult task a simple one. The moment a screwdriver applies pressure to an *if* trimmer, the effect is immediately apparent on the scope. A difficult alignment can be made in minutes. ■

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Models 14 and 15." *Fine business, Karl! Tha very much for the dope.*

W2UGM, Closter, New Jersey, puts in a ter signal on 20 meters at KØWMR. W3JOI, C mough, Pennsylvania, is building a W2JAV W3AUD, Altoona, Pennsylvania, now has a M 15.

K5IBS, Amarillo, Texas, has an FN-49/FG T typewriter Table and wonders what it is. *This is of TT-10/FG and was called a Type 132A1 T typewriter Subscriber Set during WWII. The l manual on the TT-10/FG is Department of Army TM 11-2210. As for use in an amateur RT station—it is a good mounting for Model 14 gear, the TD and the typing reperforator.*

K5ZEE, Fort Worth, Texas, has *two* Model (*So, it's a big state.*) W5RQC, Shawnee, Oklah is building the W2JAV TU. W6PZC, Merced, C fornia, is looking for information on his Bohme converter. W7JFU, Saint Helens, Oregon, is building the W2JAV TU. K8MPU, Columbus, O is looking for an AN/FGC-1.

K9DAS, Fort Wayne, Indiana, is on 40 wi pair of 803's running 750 watts and is using Mo 14 and 15. Two-meter AFSK is worked on 147.3 on 147.24, f.m., with 50 watts. W9DPY, Lomb Illinois, has 5 transmitters and 7 receivers. Dave operate on 4 bands at the same time.

KØIYK and KNØZIB, Sleepy Eye, and KØU of New Ulm, Minnesota, now have Model KØUMY is building the W4TJU TU. (*CQ*, Dec ber, 1958) WØZB, St. Louis, Missouri, is on 15 40, and 80 with a KW-1 and a KWS-1, using M 19 and 28. WØGK, Overland Park, Kansas, is b ing a new heterodyne exciter. Charles uses nar shift for code identification, by the way.

Comments

In our story on the Weather Bureau (WI RTTY transmissions in last month's column would like you to note a typographical error. frequency listed as 3225 kc should be 3235 kc.

When tuning around for commercial or mili stations to copy, don't be fooled by those stat just outside of the 75 meter phone band, just a 4.0 mc. We have attempted to copy these stat several times while they were running RY or tapes, and found their tapes full of errors. parently the tapes have torn holes.

73, Byron, KØW

SPACE [*from page 93*]

sion of facsimile mail. A facsimile letter contai the Post Office's traditional "Shop and Mail Ea Christmas appeal was bounced off the balloon s lite as it orbited the earth.

The letter was first placed on a facsimile tr mitter located in the Postmaster General's o Washington, D.C. The facsimile modulation transmitted by wire to the Naval Rese Laboratory at Stump Neck, Md. There it was pl on a microwave transmitter and beamed at E in orbit about 1000 miles above the earth. Refle from the 100 foot mylar coated balloon, the mi

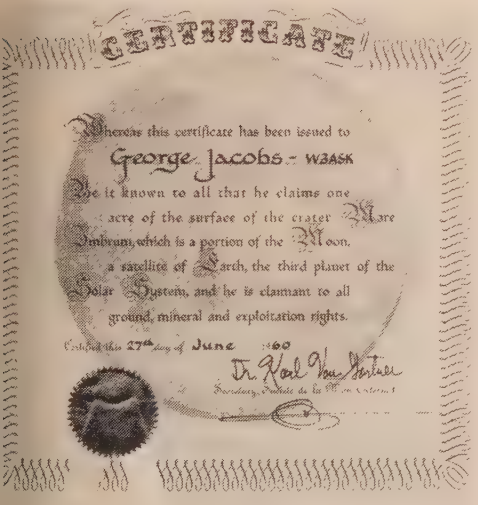
ive signal was received at the Bell Telephone boratories, Holmdel, N.J.

At Holmdel, the facsimile modulation was again aced on a land line and transmitted to the post fice at Newark, N.J. where a facsimile receiver nverted the message back to its original letter rm. The entire operation took about five minutes, t the Postmaster General said that equipment presently available capable of transmitting as any as 50 letters simultaneously in a three minute riod.

While this was an experiment, Post Office Dertment officials predict that someday large volnes of mail will be transmitted in this manner.

George's Little Acre

One of the small rewards for being Editor of a lumn in *CQ* is the interesting things that occaonally come in the mail. One such interesting tter came a few weeks ago. This particular letter interesting not because of what it said (moon ims $1 each, 6 for $5), but for what it conned. Inside the envelope was an authentic looking rtificate (complete with gold seal and my name d call written in fancy script) claiming for me ne acre of the surface of the crater Mare Imbrum, hich is a portion of the moon". (See photo).



W3ASK's claim to an acre on the moon.

I haven't made plans for a trip to the moon yet, t it's good to know that I have a claim on a ce of real estate up there. I hope that my little e is on nice high ground so that it may someday ke a good QTH for W3ASK/Moon.

Although very official looking, the claim is, of rse, a gag. But the certificate does make a nice velty and conversation piece to have hanging in shack. You can stake your claims with the low who sent me mine: "Moon Claims", Box G, 1738 201st Street, Bayside 60, New York. you're a high power man though, please stay ay from my little acre on Mare Imbrum!

73, George, W3ASK

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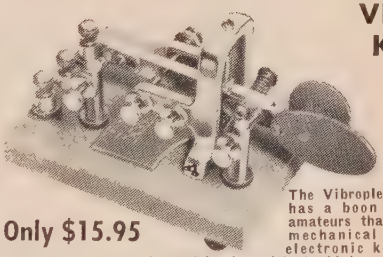
VIBRO-KEYER



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222 Mc. PARAMETRIC [*from page 29*]

Operating Suggestions

1. Put noise generator or 222 *mc* signal gene input to converter. Get 16 *mc* output rea on communication receiver.
2. Connect parametric amplifier converter signal source connected to amplifier.
3. Turn up VOLTAGE CONTROL knob on p oscillator about half way and adjust this trol and OSCILLATOR dial until noise or sig increased 10 or 15 *db* more than that o converter alone. Back off on receiver GAIN tune pump OSCILLATOR and VOLTAGE CON for best signal or N.F. This should be 5 more below oscillation point in the param amplifier.
4. Pump oscillator requires about 10 mi warm-up time to reach satisfactory stab tion. Make sure the 0B2 regulator tube s a slight glow (if power supply is less than volts under load, the 550 ohm resistor ne the power socket in the oscillator may ha be shorted out). Around 20° and 80°, reading is approximately 900 *mc*.
5. **Parametric amplifier adjustments.**
   a. The 222 *mc* tuning capacitor adjusts s input to resonance in band.
   b. BIAS CONTROL varies capacity of va diode and can be used as a vernier a ment of signal frequency.
   c. PUMP OSCILLATOR TUNING capacitor a circuit to about 900 *mc*.
   d. C_1 and C_2 adjustments are used to diss idler frequency for proper operatio pump frequency is moved very far thes justments have to be changed.
   e. Coaxial line lengths from pump osci line to converter affect the pump osci voltage and frequency adjustments.
6. In changing from noise generator, or s generator to an antenna, the pump osci VOLTAGE CONTROL and OSCILLATOR dial (i locking effect) will probably have to be cha a little. The parametric amplifier is very cal of input and output impedances, so a justment of pump power is needed. The 22 capacitor or BIAS adjustment may also slight readjustment.
7. The parametric amplifier should show ab *db* better n.f. than the converter alon should also have 10 or 15 *db* of signal when in the system.
8. When keying or switching a transmitter, be the antenna relay shorts or otherwise pr the input circuit of the parametric amp The r.f. power in the receiving coaxial should be under 0.1 watt.
9. This Hughes Products diode was not coat it is sensitive to light. *Do not tune up amp out of box.*
10. The bias voltage is "reverse bias" so no d.c rent flows through the diode. Make sure o diode polarity or battery polarity in case e

unit is replaced. An ohmmeter on "low R" scale can be used to check diode forward resistance. (Back resistance is many megohms, nearly open circuit). ■

DERSTANDING VHF TENNAS [*from page 43*]

pendicular to the axis of the antenna. With prac- the solid pattern can be visualized given only horizontal and vertical projections.

n examination of fig. 7(a) will show that our dard antenna exhibits directivity; that is, the ived power in some directions is greater than in rs. Actually, all antennas exhibit some kind of ctivity, and this effect is one of the terms of rence most often used in comparing antennas.

or example, if we assume that a given transing antenna radiates a fixed amount of power can then compare any receiving antenna with standard antenna. A comparison either of ived field strength or signal power involves a . This ratio, or comparison with reference to a dard antenna, is called the gain of the test ana and is generally expressed in decibels (db), is defined as:

$$db = 20 \log_{10} V_1/V, \quad \textit{or}$$
$$db = 10 \log_{10} P_1/P$$

here P_1 and V_1 are the received power and field sity of the test antenna and P and V are the ved power and field intensity of our standard le.

Reciprocity

general, all antennas have the property of rocity; when used for transmitting they have ame properties as when used for receiving.

r example, a transmitting antenna radiating mum energy at right angles to the axis of the na will receive maximum energy from that tion.

e gain of an antenna will be the same whether ransmitting or receiving.

highly directive transmitting antenna will be hly directive receiving antenna.

ndamentally, all antennas are transducers, that ey are devices which convert energy in one form ergy in another form. A transmitting antenna rts the power output of a transmitter into elecgnetic energy. The receiving antenna makes nergy conversion in the opposite direction.

r complete reciprocity to exist, two basic rements must be met: the characteristics of the mitted radio wave must be the same as the coming in to the receiving antenna. Thus, ion of maximum intensity, angles of arrival departure, polarization, etc., must all be the

ondly, similar terminations must exist. If the na is properly matched when used for transg, it must also be properly matched when used ceiving.

th this brief introduction, we are now ready to ss in detail the most important antenna of all—alf wave dipole. ■

[to be continued]

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(See page 151, Nov. 1960 CQ)

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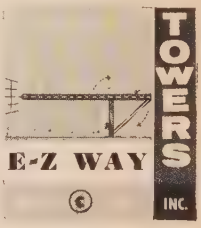

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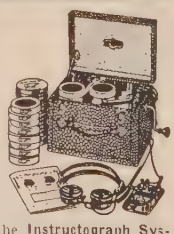

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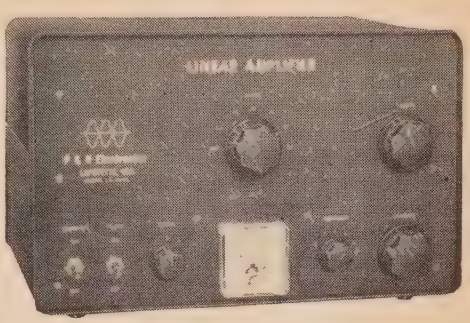

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3A5	1.00	6X5	.49	725A	2.75
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3BP1	3.99	12AT7	.89	804	8.85
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69		
We Buy!		*We Sell!*		*We Trade!*	
3E29	6.00	12AX7	.79	807	1.10
3Q4	.68	12AY7	1.29	5/$5, 10/$12	
3Q5	.86	12B4	.95		
4-65A	13.50	12BA6	.65	811	3.45
4-125A	27.50	12BA7	.99	811A	4.41
4-250A	34.00	12BD6	.59	812	3.30
4X150A	7.00	12BE6	.59	813	8.00
4X250	36.00	12BH6	.79	815	1.75
4X500	37.00	12BH7	.99	826	.59
5AP1	2.95	12BY7	1.00		
Wanted Test Sets and Equipment					
5BP1	5.02	12BZ7	.99	828	9.00
5BP4	5.00	12H6	.75	829B	8.00
5CP1	4.99	12J5	.69	832A	6.00
5CP7	9.00	12J7	.69	833A	36.00
5R4	1.00	12J8	1.35	837	2/$2
5T4	.90	12K8	.89	866A	2.45
5U4	.99	12SA7	.69	954	10/$1
5V4	.89	12SC7	.89	955	3/$1
5Y3	.60	12SF5	.69	957	3/$1
5Z3	.89	12SG7	.89	958A	2/$1
Send 25¢ for Catalog!					
15GP22	89.00	12SH7	.89	991	5/$1
6A7	1.00	12SJ7	.75	1614	2.75
6A8	.99	12SK7	.75	1619	5/$1
6AB4	.59	12SL7	.79	1620	2.00
6AC7	.72	12SN7	.69	1625	3/$1
6AG5	.65	12SQ7	.69	1626	5/$1
6AG7	.75	12SR7	.69	1629	4/$1
6AK5	.69	15E	1.19	2050	1.25
6AL5	.59	15R	4/$1	5517	1.25
6AQ5	.66	FG17	3.49	5608	3.95
Top $$$ Paid for 304TL, 726B Tubes					
6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.69	5725	1.95
Top $$$ Paid for XMTTR Tubes!					
6BK7	.99	FG27	8.28	5732	2.00
6BL7	1.35	HV27	19.39	5736	85.00
6BN4	.69	28D7	.89	5749	1.95
6BN6	1.08	FG33	15.00	5750	2.75
6BN7	1.99	EL34	3.49	5751	1.25
6BQ6	1.19	35A5	.69	5814	1.20
6BQ7	.99	35L6	.59	5879	1.20
6BX7	1.11	35T	4.49	5894	12.00
6BY5	1.19	35Z5	.89		
6BZ6	.91	RK39	2.99	No See—Write!	

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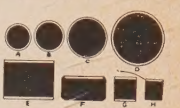

5AP	ROUND 1⅛" Dia.—250ua	$1.00
10AP	ROUND 1½" Dia.—360ua	$1.75
15AP	ROUND 2" Dia.—750ua	$3.00
2BP	RECT ⅜ x 7/16—75ua	.70
5BP	RECT—200ua	$1.25
10BP	RECT 1-11/16 x ⅞—360ua	$1.89
KIT ALL SIX **ONE EACH**		$7.00

This Item Shipped Postpaid $5 up.

AC POWER SUPPLY FOR ART13 — "TABPAK" DELIVERS 1250VDC, 500VDC & 28VDC AT 10 AMPS. ALL FILTERED. USES SILICON H'SEALED DIODES. "TABPAK"® PS/ART13 .. $125

SELENIUM RECTIFIERS 130/RMS HALF WAVE

75Ma 49¢, 5 for $2; 100Ma 59¢, 6 for $3
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300Ma 88¢, 5 for $4; 350Ma $1.00, 8 for $7
500Ma $1.35, 5 for $5
This Item P.Pd. 48 states orders $10.

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"SILTAB" Silicon Rectifier Replacement
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FOR 6 or 12VDC @ 100A, Type YJ9 $24

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NEW *SILICON 750 Ma TOP HATS!
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rms/piv	*rms/piv*	*rms/piv*	*rms/piv*
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rms/piv	*rms/piv*	*rms/piv*	*rms/piv*
280/400 50¢	350/500 62¢	420/600 80¢	490/700 95¢
rms/piv	*rms/piv*	*rms/piv*	*rms/piv*
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Use in Bridge or C.T. up to 1 Amp DC
"TAB" Special General Purpose Silicons
400 PIV @ 300Ma 39¢@, 25 for $8.00
*Derate 20% for Capacitive input

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2N441/$3; 2N442/$4.50; 2N277/$4; 2N278/$5; 2N155/$1.39; 2N176/$1.80; 2N177/$1; 2N178/$1.75; 2N247/$1.50; 2N255/$1.20; 2N270/.95; 2N274/$1.25; 2N408/.80; 2N554/$1.20; 2N578/$1.80; 2N579/$2.20.
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DELCO POWER HEAT SINK $1.00

Wanted 304TL Tubes & ALL TYPES!!!

"VACDAC"® SILICON TUBE REPLACEMENTS
WITH BUILT IN RF SURGE & SERIES BALANCING PROTECTION

TYPE	VRMS/PIV	AMPS	PRICE
ST866	5000/10400	0.3	$20.00
ST816	5000/7000	0.3	$16.00
ST5R4	1900/2800	0.5	$15.00
ST5U4	1120/1600	0.6	$ 8.00

SELENIUM F.W. BRIDGE RECTIFIERS

DC AMP		18VAC 14VDC	36VAC 28VDC	72VAC 54VDC	130VAC 100VDC
One Year Gld	½	$1.00	$1.90	$3.85	$5.00
	1	1.30	2.00	4.90	8.15
	2	2.15	3.00	6.25	11.10
	3	2.90	4.00	8.60	13.45
	6	4.15	8.00	18.75	31.90
	10	6.10	12.15	26.30	41.60
	12	7.75	14.90	30.95	43.45
	20	12.85	24.60		
	24	15.00	29.45		

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Kit 8 pcs Nut Driver Set		
Kit Hi Gain Xtal Mike		
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Kit 2 pair SO239 & PL59		
Kit 12 Binding Posts Asstd		
Kit 3 Phone Plugs Asstd		
Kit 5 Phone Jacks Asstd		
Kit Long Nose Plier		
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Kit 3 AN Plugs & Sockets		ONE EACH ABOVE KIT ONLY
Kit 5 Sub-Min Tubes		
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Kit 35 Power Resistors		
Kit 75 Silicon Diodes		
Kit 4 Rolls, 50ft/ea. Asstd. Color		
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Kit 100 Ceramic Condensers		
Kit 5 FT243 Xtal Holders		
Kit 5 Microswitches		
Kit 10 Wheat Lamps		
Kit 3 Transistor Xtmrs		
Kit 8 Xtal Osc-Blanks		
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Kit 500 Lugs & Eyelets		
Kit 5 Ib Bathtub Potting Compd		
Kit 10 Transmit Mica Cond's		
Kit 3 Glyptal & Cement		
Kit 3 Phone/Patch Xfmrs		
Kit 4 AN/Reflector Lites		
Kit 6 Insltd Tuning Tools		
Kit 4 "Suncells" Asstd.		

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VDC to 500VDC
up to 200MA
atts; Tap at 250VDC
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ciency, low ripple, low idle current-rectifiers! Toroidal HiEff! Mag-tape wound transformer, fused & ircuit proof, small in size! Quiet! veight! C1250EE built, ready to go. atively Rated. Delco Transistors Duty Finned Delco Heatsinks.
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'ASS 60 or 90 or 150 Cys...each $2
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OVEN—115V&Thermostat $2
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6 & 12 volt bat-

6-12V $10.00

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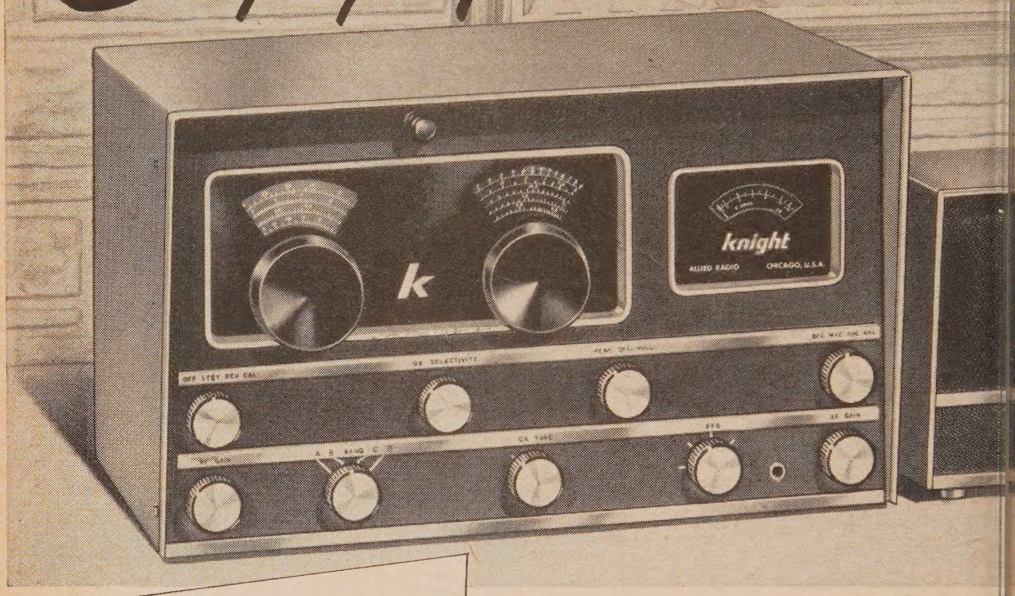

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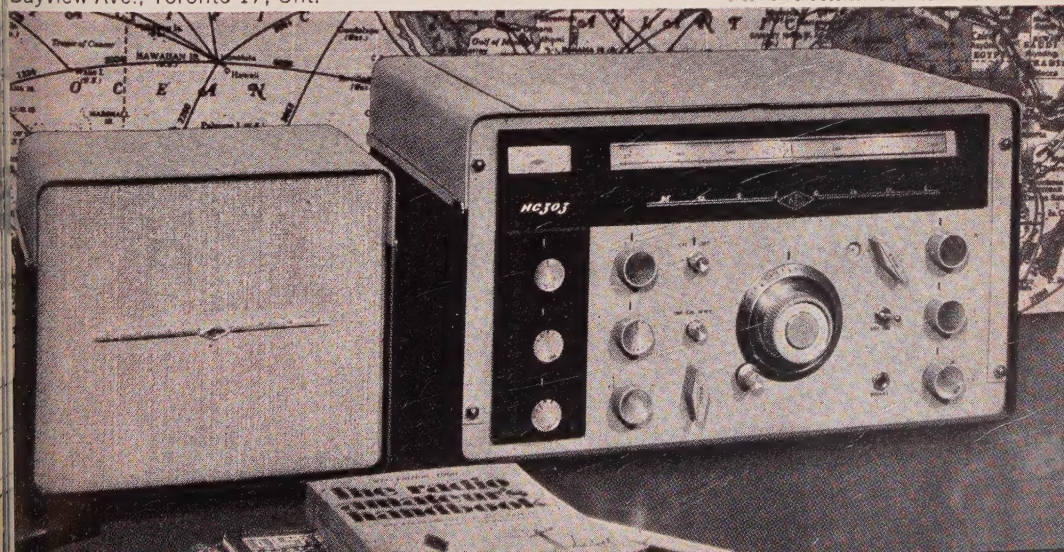

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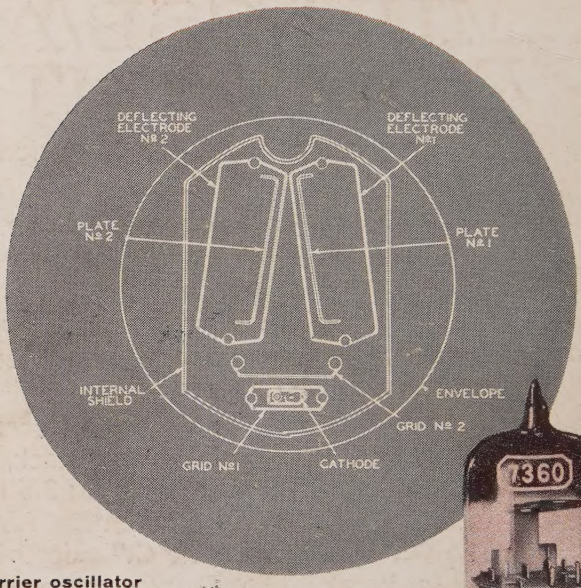
RCA-7360 Beam-Deflection Tube...

simplifies SSB!



- **Balanced modulator-carrier oscillator functions within a single tube**
- **Product-Detection in One Tube (RCA-7360 needs no separate oscillator)**
- **At least 60 db of carrier suppression in balanced-modulator applications**
- **At least 40 db suppression of oscillator signal in balanced-mixer applications**
- **At least 80 db of carrier suppression in filter type of SSB exciters**
- **"Stay-put" circuit tuning over a wide temperature range, and throughout tube life**
- **Push-pull rf or af output for single-ended input—with one tube.**

Shown a

Specifically developed for SSB and DSB suppressed-carrier rigs, RCA-7360 is the sm mighty tube that can "double-up" on a number of exciter functions at frequencie 100 Mc. It simplifies circuitry—makes it practicable to use inexpensive components.

Here's how it operates! The cross-section shows the main elements of the RCA-73 single flat cathode, control grid, and screen grid form an electron gun which ge controls, and accelerates a beam of electrons. The total plate current to the two plat given plate voltage) is determined by the voltages applied to the control grid and the grid. This total plate current varies with the bias or signal voltage on the control gr any conventional tube. The division of the total plate current between the two p determined by the difference in voltage between the two deflecting electrodes.

RCA-7360's are now available at your RCA Industrial Tube Distributor. For a te bulletin on RCA-7360, see your RCA Industrial Tube Distributor. Or write RCA, C cial Engineering, Harrison, N. J.

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